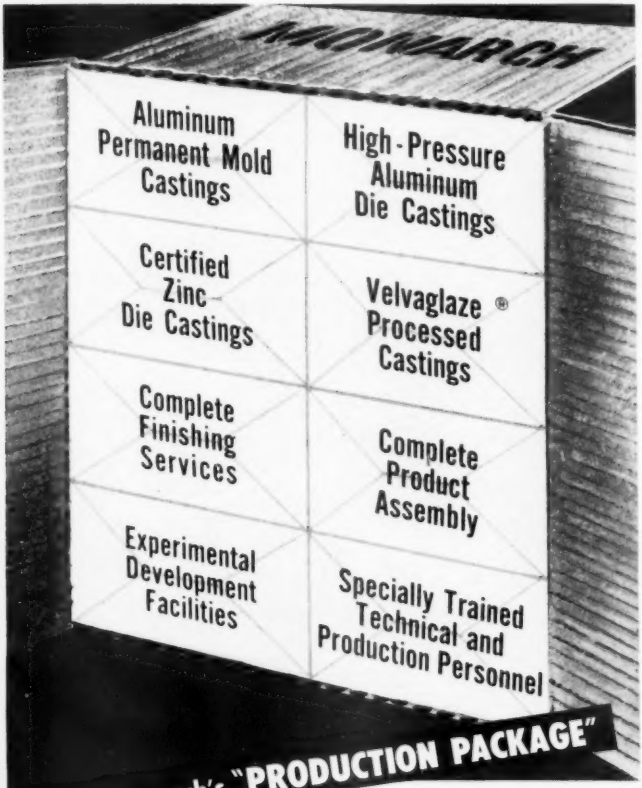
PRECISION METAL MOLDING

INCLUDING DIE CASTINGS MAGAZINE

PMM

DESIGN • MANUFACTURE • FINISHING • USE



..a unique combination of vital services and facilities which very few foundries are in a position to offer

For 39 years, leading manufacturers in many industries have learned to depend upon Monarch men, methods and machines for efficient production of their casting requirements and the many related services which these castings often require.

Contact your Monarch representative... discuss your problems and requirements for civilian or defense programs... use the services and facilities outlined in Monarch's Fact-File. Send for your copy today.

MONARCH ALUMINUM MANUFACTURING COMPANY
Detroit Avenue at West 93rd Street, Cleveland 2, Ohio

CASTING NEWS NOTES

ONE OF THE FEW companies operating a complete Permanent Mold Division and a Diecasting Division producing High-Pressure Aluminum and Certified Zinc Castings under one integrated management, Monarch Aluminum Mfg. Company now operates over 300,000 sq. ft. of modern production facilities at 9301 Detroit Avenue, Cleveland.

* * *

THESE FOUNDRY operations complement each other, allowing Monarch to suggest sound solutions for every casting, finishing and product assembly problem. Customers find these suggestions practical and economical because Monarch never "over-reaches" to secure a job that is not fundamentally suited to the end result expected from each casting process.

* * *

AMERICA'S LEADING manufacturers have continually utilized Monarch's recognized "know-how" on finishing operations and product assembly to achieve the most economical production costs embodying the highest standards of quality. Monarch personnel are trained in "end-product" quality requirements.

* * *

MONARCH INTRODUCED a new, revolutionary casting finish—VELVAGLAZE*—to provide brighter, smoother, more durable Permanent Mold and Aluminum Diecastings with cost savings up to 50% of normal, less desirable polishing methods.

* * *

VELVAGLAZE* is now specified by many manufacturers of consumer goods items because it offers their products a new standard of appearance and quality at the point of sale. The durability of VELVAGLAZE* eliminates much of the service complaints usually experienced in home operation.

* * *

FOR FULL DETAILS on Monarch services including VELVAGLAZE* write to MONARCH ALUMINUM MFG. COMPANY, DETROIT AVENUE AT WEST 93rd STREET, CLEVELAND 2, OHIO

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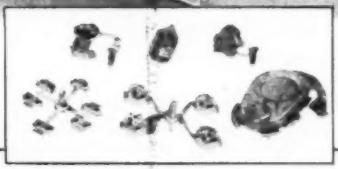

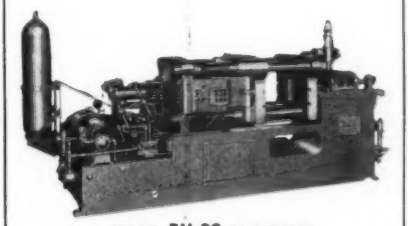

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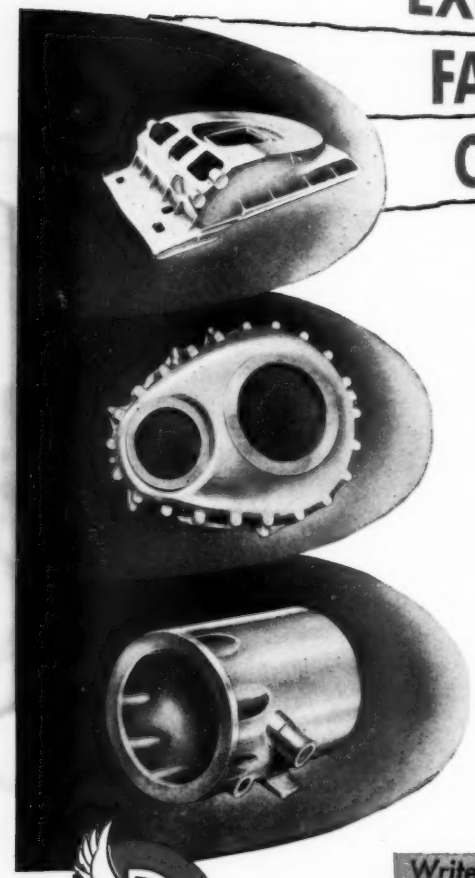

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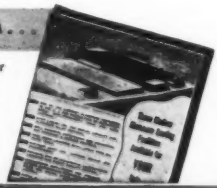
Write for Bulletin 20-A...

This new Bulletin illustrates and describes our complete facilities for serving your aluminum castings requirements. Recommendations and estimates given without obligations.



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ALUMINUM PERMANENT MOLD and SAND CASTINGS... HARDENED, GROUND and FORGED STEEL PARTS

AUGUST 1952
Vol. 10 No. 8

PRECISION METAL MOLDING

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LETTERS TO THE EDITOR

ABRASIVE BLAST FOR CASTINGS

As a subscriber to your magazine, I have looked through a number of issues in an attempt to locate an outfit that builds equipment that would perform a sand blasting operation for zinc die castings, or something very similar to that. We use, on a volume basis, relatively fragile zinc die castings and have found tumbling a bit too rough on the parts. If there is a company who makes equipment such as that I described would you please let me know who it is. We feel that the sand blasting operation is about the only way to obtain the results we require.—T.S.J.

Abrasive blast equipment of several types is widely used for surface finishing, flash removal and cleanup preliminary to painting of zinc and aluminum die castings. Names of suppliers of this type of abrasive blasting equipment have been forwarded.

One of the most effective methods has been to blast the castings with super-fine abrasive suspended in water which permits finer abrasives, and hence closer tolerance finishing. A review of one such application was recently publicized in PMM in our Simplified-Solutions department, a copy of which has been forwarded.—Ed.

DIE CAST DIAL HAND

We are interested in a small quantity (one to two thousand) of a dial hand or pointer 1⅞" long having at its center a set-back knob. We are wondering if some die caster has such an item produced from stock dies in many different styles. If there is a book published showing stock dies available for items such as we are looking for we would like to know how we can get a copy.—R.M.W.

Could you put us in touch with a manufacturer who pro-

continued on page 8

LINDBERG IN England

Manufactured by the Electric Furnace Company, Ltd., these two-chamber Lindberg-Fisher melting furnaces are installed in the Newcastle-under-Lyme works of the British Thomson Houston Co.

This installation is typical of many others throughout the world where Lindberg-Fisher melting furnaces . . . utilizing the famous two-chamber principle . . . are minimizing metal impurities, reducing metal losses, speeding production and cutting costs.

Lindberg-Fisher melting furnaces will solve die casting production problems . . . for details and "case history" information contact your nearest Lindberg-Fisher representative.

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for all industrial uses

With Accumet Precision Castings, Crucible has developed a process of producing precision investment castings in intricate designs with the smooth, satiny finish and closely-held dimensions characteristic of "lost wax" castings. Casting tolerances start at plus or minus 0.005" although under certain circumstances closer tolerances can be held. This relatively new metal forming process solves many difficult problems in design, tooling and production of metal components.

fuel injectors from precision castings

Fuel injectors and carburetors for aircraft are mechanisms containing a variety of peculiarly shaped component parts. The usual procedure is to use hardenable, chrome stainless steels, Types 416 and 440F, which are most adaptable to easy machining. However, to save costs in machining from bars, stocks and forgings, Crucible applied Accumet Precision Castings. The close size control and good surface finish of the castings eliminate many costly machining operations — saving manpower, machine time and tooling expense.

more information available on castings

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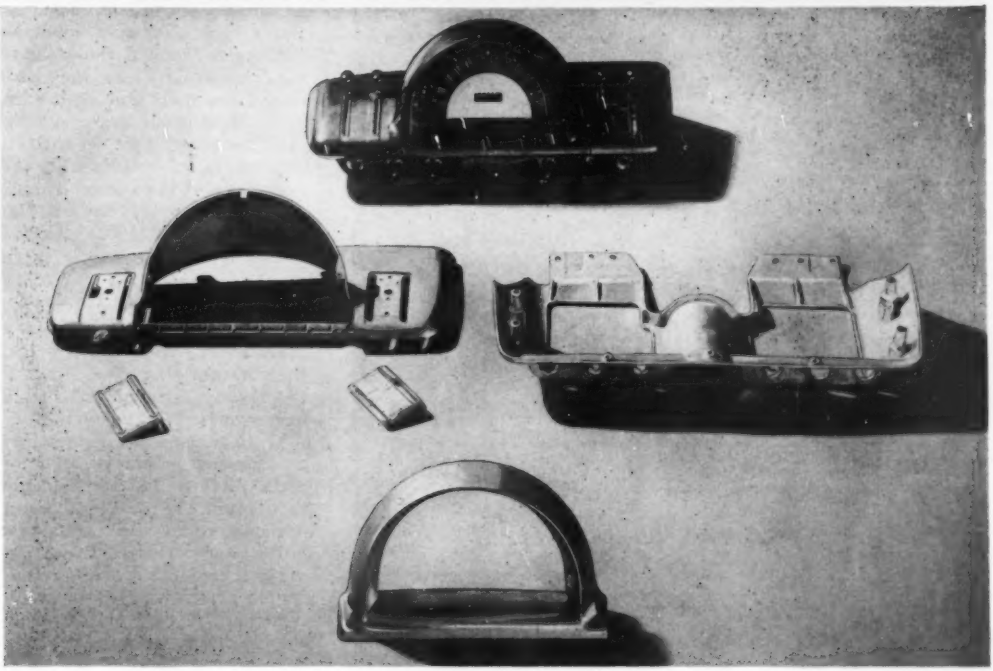

Production of these components for the 1952 Mercury instrument panel assembly again emphasized Precision's ability to—

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- Produce die castings of unusual shape and structure with such close tolerances as to make final assembly easy and simple with resulting low cost.
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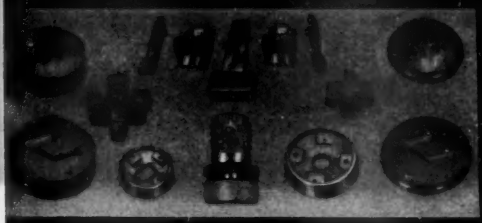

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LETTERS TO THE EDITOR
continued from page 4

duces standard aluminum die cast control knobs?—E.M.

Because it is not common to produce from stock dies, no compilation of such die castings has ever been brought together into a book. However, some die casters do have a few specific types of items which they produce from their own dies, such as pulleys, small gears, plumbing fittings, etc. We submit this request to our readers in the event any of them have a stock die for producing die castings such as reader R.M.W. describes. —Ed.

DIE CAST LEAD TAGS

We are interested to read the letter of page 4 of your June publication. We recently had the pleasure of solving the casting of these tags onto nails for a firm over here (England).

The Company had spent many thousands of pounds on an automatic machine but were unable to obtain results. We thought that we could deal with this problem on our smallest diecasting machine fitted with a controlled head. We always advise customers to control the speed of injection when diecasting lead. The method of operation is as follows:

One girl operates the machine at 10 shots per minute using a 20 impression die. The die itself comprises a number of loose plates which are loaded by two girls away from the machine. After each shot the die plate is removed from the machine and another loaded plate inserted, this operation being repeated at the rate of ten times per minute. A further girl is required for unloading the finished plates and breaking off the sprues.

You will see that for the cost of a comparatively cheap diecaster and the labor of four unskilled girls, it is possible to obtain an output of between four to five hundred thousand nails per forty hour week—G.M. Cadbury, E.M. B. Co. Ltd., England.

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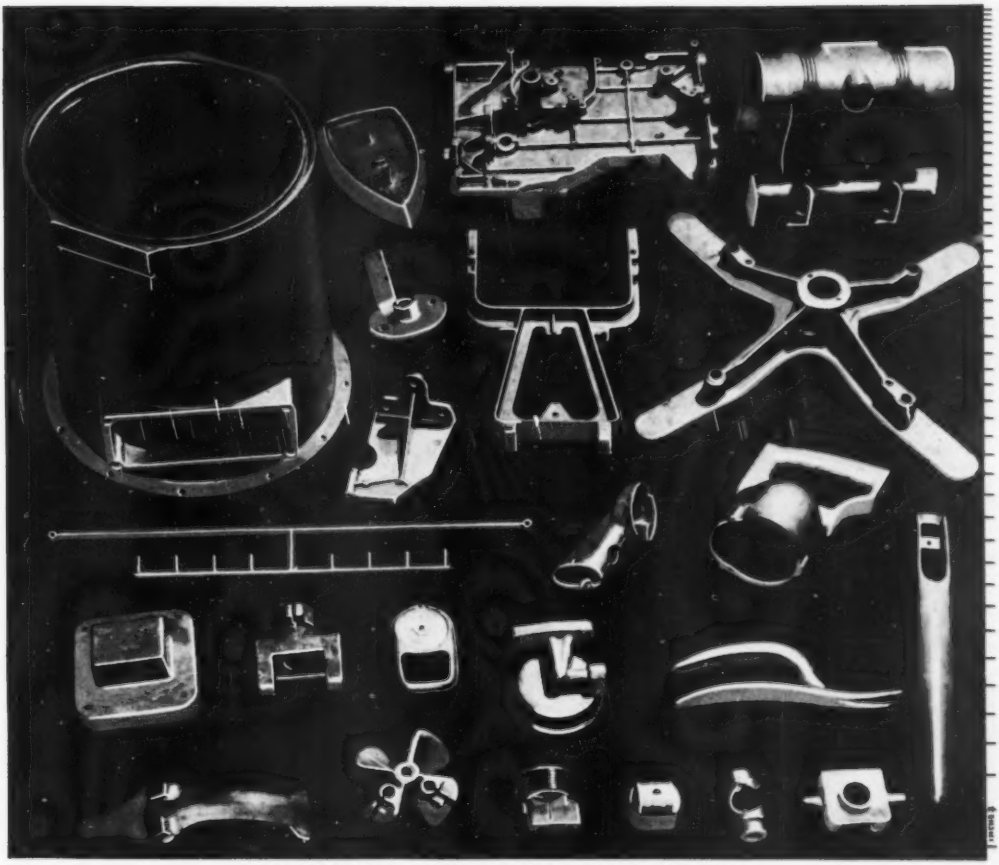

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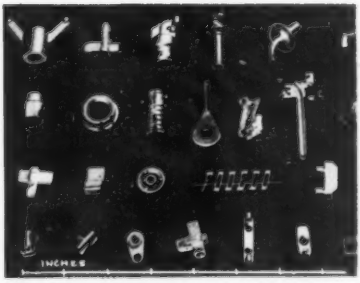
in All Commercial Sizes for War or Peace



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150-A For Small Die Castings

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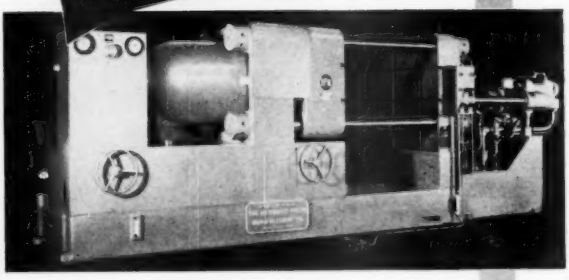

SPECIFICATIONS

	MODEL NUMBER				
	150—A	150—Z	400-A-M	400-A-S	400—AV
SIZE OF DIE PLATES	24½x24½	24½x24½	38x38	45x45	36x36
SPACE BETWEEN BARS	15½x15½	15½x15½	23x23	30x30	36x36
DIE OPENS	12	12	16	16	20
MAXIMUM DIE SPACE	28	28	42	42	42
CAPACITY PER SHOT (LBS.)	4 (AL)*	10 (ZN)	12 (AL)*	12 (AL)*	12 (AL)*
NET WEIGHT (LBS.)	13000	16000	40000	44000	33000

*NOTE: These models handle brass and magnesium die castings as well. Complete specifications on request.

CHECK THESE H-P-M DESIGN FEATURES

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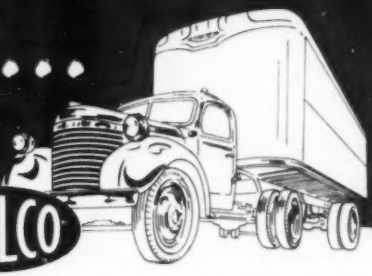

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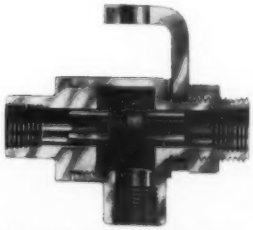

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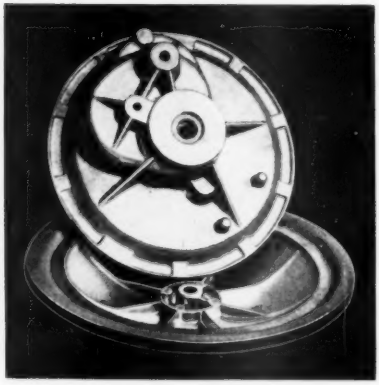

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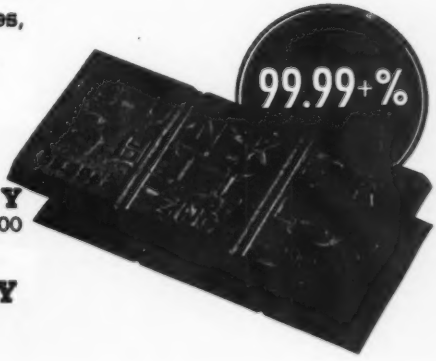

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Capacity in Ounces	16	2½	12
Std. Dia. of Plunger	1½"	1"	1.200"
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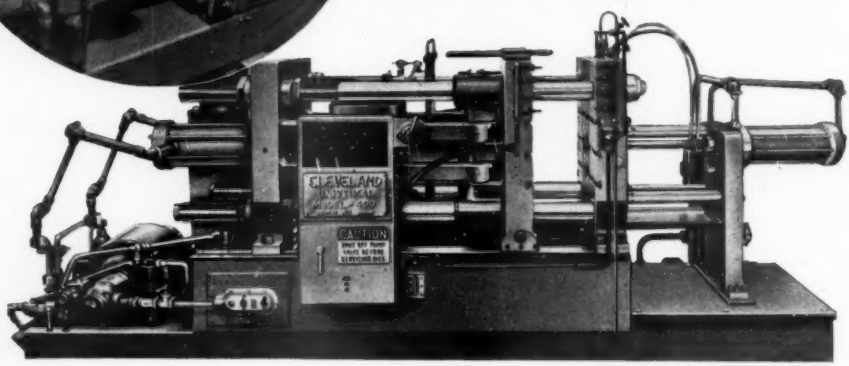

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Aluminum die casting
about 2/3 actual size

fill better on a LESTER

The part shown here is a die cast aluminum impeller for a new automotive transmission. Rising from a cylindrical wall are eleven spiral blades which taper from 1/4" thick down to .045". It's a tough bird to cast. But even though other engineers told them it couldn't be done, Manor Die Cast Corp. of Cleveland has been running the job for months on their HHP-3X Lester-Phoenix machine equipped with a Pre-fill.

The unusual flexibility of speed and pressure in the Lester Pre-fill system, coupled with the tremendous clamping abilities of the beam-type frame, gives Manor a decided competitive advantage: *the blades are cast up to .010" THINNER than the same part run on competitive equipment, resulting in marked improvement in the transmission's performance.*

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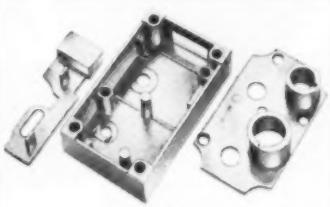
And because they are made from zinc and aluminum alloys, Hoover Die Castings often can replace more expensive metals while making the finished product lighter, stronger, and more satisfactory in the hands of its users.

Isn't this a good time to talk it over? Hoover has the staff, the facilities, and the experience to give you practical help with your planning and to assure on-the-dot accuracy and on-time delivery.



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Formerly made from bronze, this lock assembly is now die-cast by Hoover for a famous manufacturer.

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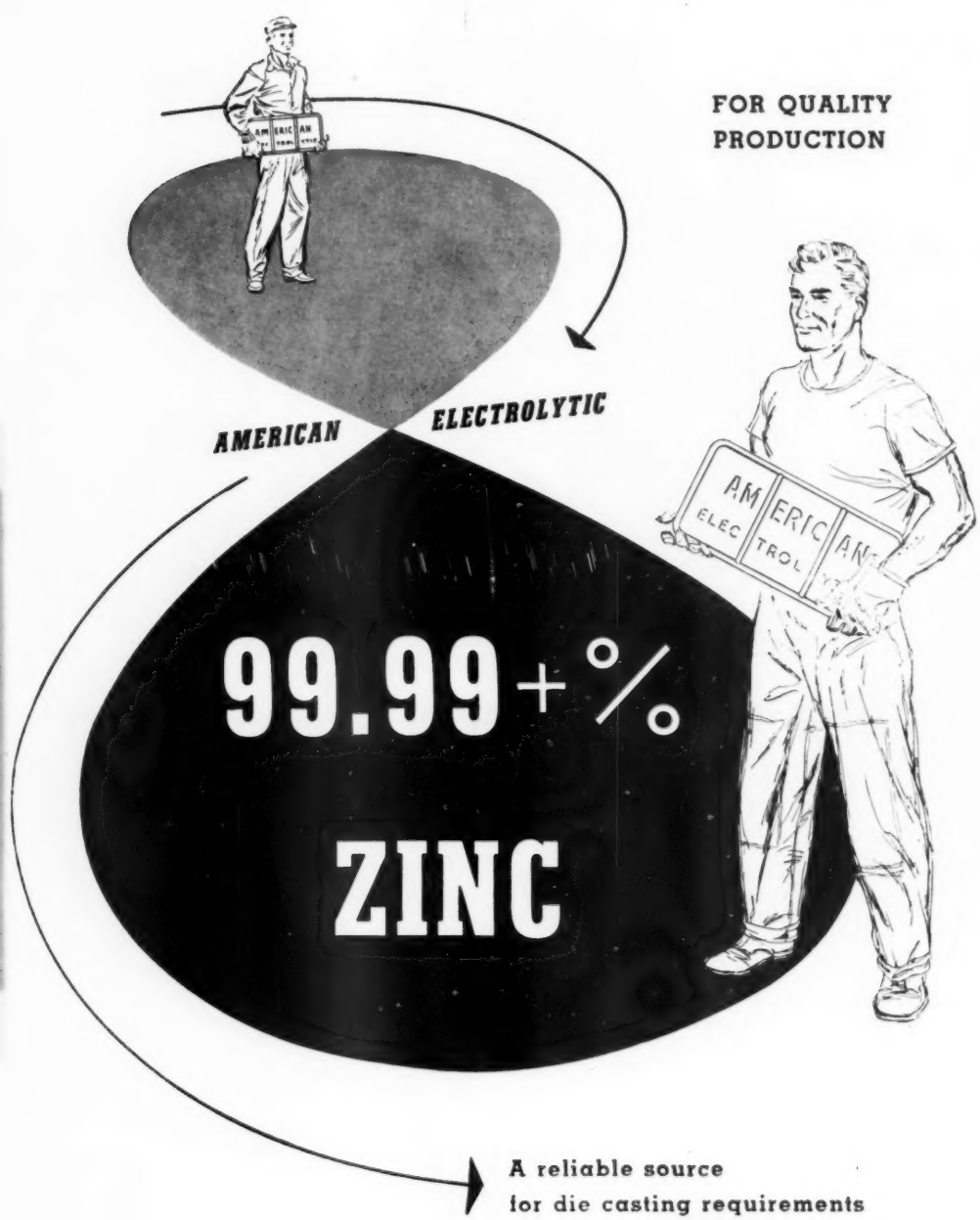

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For many years the foundry of Thompson's Light Metals Division quietly cast thousands and thousands of hard-to-make precision parts in light alloys of aluminum and magnesium.

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LIGHT METALS DIVISION

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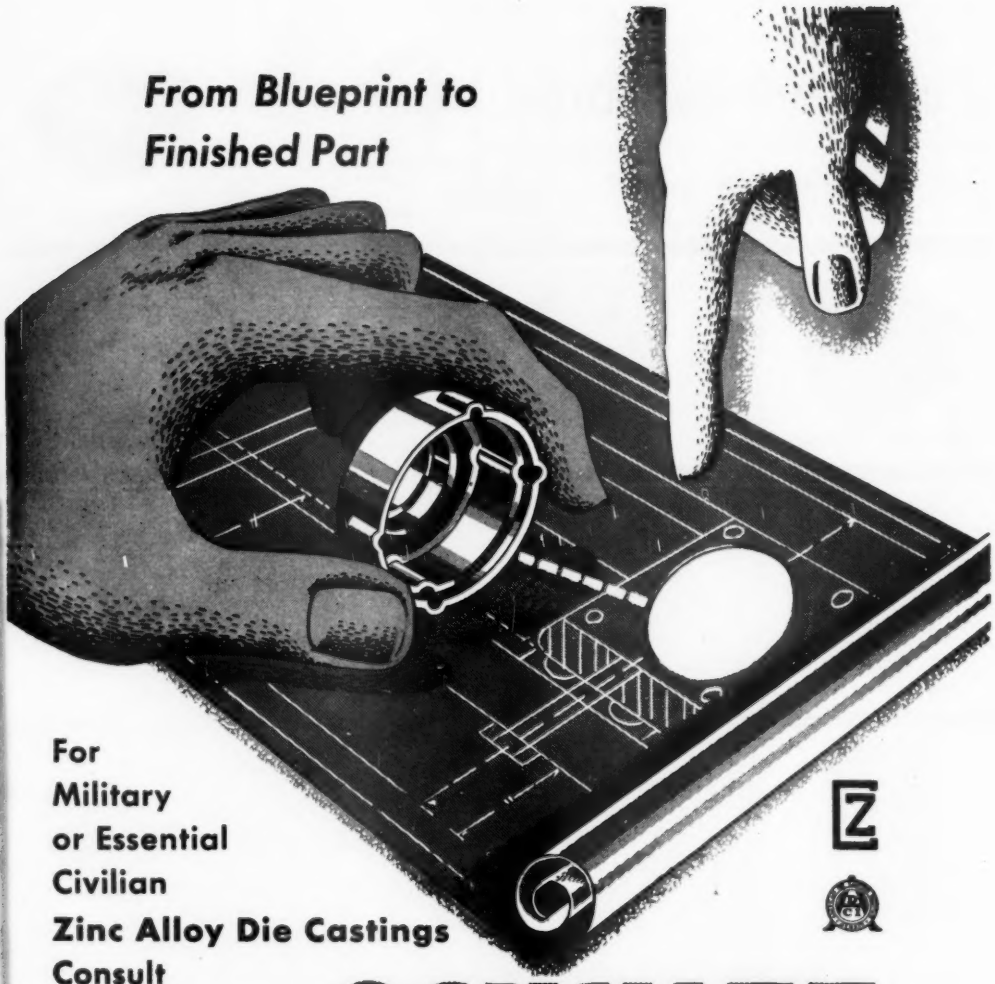

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Portable electronic equipment improved with magnesium DIE CASTINGS

By BRONE M. WALUNAS*

THE "Walkie-Talkie" of World War II achieved its niche in the hall of fame because of its ruggedness, dependability, and portability. Good though this piece of equipment was, it had several faults of which weight, bulk and lack of complete weather resistance were important.

Development work in the past few years has developed a companion piece of equipment which has none of the defects noted above. This successor to the World War II "Walkie-Talkie" being manufactured by the Raytheon Manufacturing Company's Special Products Division, Boston, Mass., is a small lightweight, completely weather-resistant piece of communications equipment. Combined in one small unit that can be held in one hand, is a combination receiving and transmitting installation. The instrument has a range of up to three miles and can operate on any one of a large number of different frequencies. Shift from one frequency to another is easily and quickly made in the field.

A major contribution to the lightweight and compact design of these units is the use of magnesium and aluminum die castings for the case, cover, and the chassis.

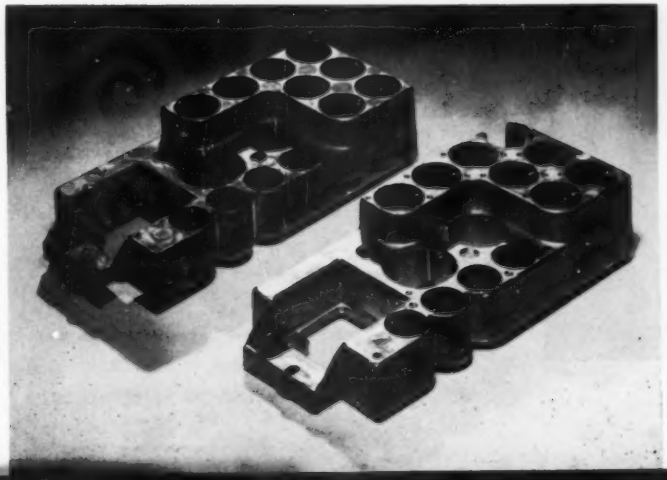
THE CHASSIS

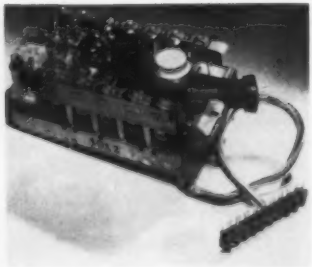
All of the electronic components of the portable transmitter-receiver, except the microphone and ear set, are mounted on or in the chassis shown below. In spite of its apparent simplicity, this aluminum die casting is about as difficult a piece as the die caster is called on to make. The multiplicity of holes with the thin web between them, the close

continued next page

*Project Engineer-Mechanic, Special Products Division, Raytheon Manufacturing Company.

ASSEMBLY OF PREFORMS, right, necessitates closely held dimensions on all cored holes in this complex mounting base, below, die cast to ±.002 on centers.





tolerances that are mandatory, the relatively great change in section, and the fact that aluminum is used, all contribute to an extremely difficult job.

Since assembly is entirely with preforms, the accuracy of spacing of the various components must be maintained at a rather high level. Most of the cored holes in the chassis are, therefore, held to ± 0.002 center-to-center tolerance. Fits and concentricity are also of importance so that an equally small variation in diameter and run out is available.

Holes down to a size to accomodate a 6-32 tap are cored. All smaller ones are drilled and all holes tapped.

MAGNESIUM DIE CAST housing halves give the right combination of lightness, accuracy and close-mating of front and rear housing. Sealing process renders them completely water tight.

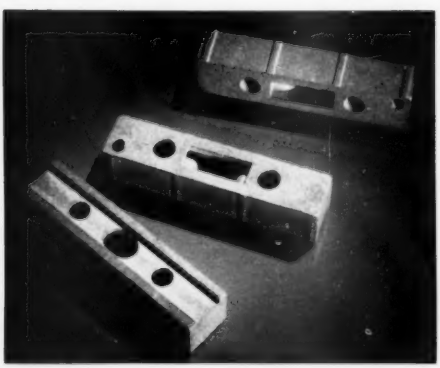
THE CASE AND COVER

Two magnesium die castings, made by the Aluminum Co. of America, are used for the housing. These castings represented a major design problem since they had to be sufficiently large to accommodate the chassis with all of the receiving and transmitting paraphernalia, a battery, microphone, and diaphragm type receiver. In addition, the case had to be small enough to be held easily in one hand and curved so that both receiver and transmitter would be in proper ear to mouth relationship. The case further was required to be strong enough to protect the equipment from damage when dropped, light-weight enough to preclude fatigue when used for moderately long periods of time, and capable of being sealed in a watertight manner.

When all of these requirements were considered, a magnesium die casting seemed to provide the optimum. As can be seen from the photo, the final casting is extremely thin-walled and contains all of the necessary lugs and bosses for mounting equipment inside. The two halves seat on a neoprene gasket to give the desired watertightness. All holes for any purpose are closed with watertight components and fittings.

One test required of the case castings is that they be pressure tight when subjected to five pounds air pressure. Some few castings show minor porosity; these are successfully sealed by impregnating with Meta-Seal, a preparation and process developed by the American Meta-Seal Co. of New York. Secondary machining operations are limited to drilling and tapping holes, practically in all instances the holes are blind and the depth of drilling and tapping must be accurately controlled to prevent break through. The ejector pin bosses on the sides are removed by straddle milling.

The final finishing operation is to prepare the surface with the Dow No. 7 treatment, prime with a zinc chromate primer and follow-up by spray painting and baking.



Longer life due to POWDER METALLURGY

YOUR ELECTRIC SHAVER, works better and lasts longer thanks to powder metallurgy. The shaver block shown is made from an iron copper mixture (93 percent iron, 7 percent copper) by the Presmet Corp. of Worcester, Mass. for one of the leading electric shaver manufacturers. The most desirable design for this part would involve much complex machining. As made from powder, however, all of the required features can be incorporated at no greater cost than a simple rectangular block other than the first die costs. By making the part intentionally porous the weight can be kept down without sacrificing any strength characteristics that are necessary.

Crushing strength requirements met by POWDER METALLURGY

IN THE MANUFACTURE of textile machines, as well as many other types of industrial equipment the materials specifications set up by the design engineers may call for physical properties that are far higher than are actually needed. This is quite understandable when one considers that the original materials available had these high minimum physicals.

The ever-present need for cost reduction brings before the designer many new materials and fabricating methods which are too often rejected without full consideration because strength is lower than that of presently-used materials. An analysis of the strength requirements will often disclose that these so-called "weaker" materials are more than adequate for the job at hand and, in many cases, are functionally superior as well as lower in cost.

The chain roll, above, made by the Presmet Co., of Worcester, Mass., illustrates how the search for lower costs has ultimately produced a part superior in most respects and adequate in all respects to the part it replaces at a lower manufacturing cost .

The original conception of the service requirements for these chain rolls was high resistance to wear and the ability to withstand moderate shock. Crushing strength was considered of paramount importance. The first rolls were gray cast iron machined all over. These rolls functioned reasonably well and were used only because they were considerably less expensive than a machined roll. With the advent of high speed screw machines it became possible to convert from the cast iron roll to a steel roll made on a screw machine. However, the steel roll had to be hardened to give the desired wear characteristics.

More recently another change has been made. This time to powder metallurgy as a fabricating method. The roll is made from iron powder to which has been added about five percent copper. As furnished by the fabricator a light grind on

continued on page 86

ALMOST EQUIVALENT in wear resistance and crushing strength to a fully machined and hardened steel roll, this powdered iron part is a highly satisfactory replacement at a fraction the cost.

TABLE 1

COMPARISON OF WEARING QUALITIES AND CRUSHING STRENGTH

	Steel Roll	Powdered Iron
Average wear	37 mg./1000 cycles	25 mg./1000 cycles
Crushing strength	3940 lbs. total load	3000 lbs. total load

INVESTMENT CAST GUN-SIGHT parts that have been substituted for the more expensive counterparts made from bar and plate stock. The use of investment casting as a fabricating method speeded up production, cut down on purchases of machine tools, and reduced parts costs.

Costs cut 30% by INVESTMENT CASTINGS

THE modern gun sight requires in its manufacture, a degree of precision that only a few years ago was applied to tools and instruments that were "handled with kid gloves." Investment casting is, therefore, used wherever possible as a means of fabricating parts which would otherwise require extensive machining or assembly by brazing of several carefully machined components.

A representative group of investment castings for gun sights are shown in the illustration. All of these castings are either type 303 stainless steel or SAE 1020 steel. All of the parts shown are made for the Cummings Machine Works of Boston, Mass., by the Hitchiner Mfg. Co. of West Hartford, Conn.

Prior to the start of manufacture of this sight by Cummings, the parts shown were machined from bar stock. While not all of the machining operations could be eliminated by the change in fabricating methods, a significant decrease in machine hours was achieved. Some minor difficulties were encountered, but all of these have been overcome or minimized. The net result has been a decrease in the manufacturing cost by almost 30 percent and a materially faster delivery without the installation of additional machine capacity.

The acceptance of cast parts while meeting with some difficulties was finally achieved with the co-operation of Army Ordnance Fire Control Engineers. They were convinced that the investment castings were equally as satisfactory as the older parts and to-day more and more government specifications call for the use of castings.

It is noted above that some difficulties were encountered in the production of these castings which necessitated machine work after the castings were delivered from the foundry. Since these difficulties seem to be inherent in castings of the particular configuration found here, some discussion of them would seem to be valuable.

Acute internal angles create problem

One of the major difficulties was the formation of bubbles wherever a sharp internal angle with near to a zero radius on the fillet was encountered.

While the cause of the bubbling has not been exactly pinned down, it is thought to be due to one of two conditions. At the time the wax or plastic pattern is invested, small air pockets may remain in these acute angles, trapped in such a way that vibration of the mold assembly will not dislodge them. While turning the pattern over can help to minimize this condition in some cases, there are other cases where an acute internal angle occurs on both sides so that no relief could be secured by reversal of the pattern. Further, from a foundryman's point of view, there may be serious objections to this reversal so that if the bubbling is due to entrapped air, nothing can be done about it.

Another possible source of the bubbling is chipping of the investment after the pattern has been burned out. An attempt to secure an extremely sharp corner will necessitate a feather edge on the investment. Such an edge is bound to be weak and chipping in handling may well result. Again this is a condition that is outside of the control of the foundry and only redesign to give a larger fillet will solve the problem.

The designer is faced, therefore, when this condition exists, with either machining to remove any surface imperfection that may be present or allowing a larger fillet to prevent the formation of bubbles.

Thin sections are easily straightened

Sagging of the thin ears on some of the parts can be directly traced to the design of the parts. In some cases, such as these gun sight parts, redesign to "beef-up" the ears is not possible. A straightening operation is, therefore, to be expected. The trouble can be minimized by allowing the castings to cool almost to room temperature before they are shaken out of the flasks. This long cooling time is, however, extremely uneconomical and would result in a materially increased casting cost. The exceptional economy of producing these complex shapes without undue machining more than offsets any slight additional cost of the straightening and it is therefore, only a minor consideration.

Another unexpected source of secondary operations was found in the need of straightening the two leaves used as rear and front sight members. The ratio of length to section thickness of both of these parts resulted in warpage. Here again the results found are not within the control of the foundry. Redesign is the only answer that would prevent the warpage and since it was not possible to alter design in this case, a straightening operation became necessary.

The adjustments needed in converting from machining to investment casting are detailed only to show that in many cases a slight amount of redesign will solve foundry problems and also that in spite of some bothersome features, it is still possible to show a material saving in manufacturing cost by converting to investment casting as a fabricating method where the parts lend themselves to such a conversion.

Beryllium copper cavities for DIE CASTINGS

A COMPANY which specializes in producing cavities cast under pressure in beryllium copper for plastic molding was surprised to learn, more than a year ago, that many of the cavities which had supposedly been destined for shaping plastics were, in fact, being successfully used for producing quality zinc die castings.

Investigation revealed that some die shops had been introducing these beryllium copper cavities where fine surface detail or multiple cavities were required, especially those having conformations difficult to machine inside of a die cavity.

At the present time, at least a half dozen commercial die casting plants are using such cavities for production runs. The editors of PMM have attempted to gather together as much data as is available concerning the physical properties of beryllium copper, the service characteristics of the cavities, the methods of forming them, normal tolerances that can be held, limitations on shape, and other information of value to die casters who might consider use of this new process.

NON-SYMMETRICAL CAVITIES can be produced in beryllium copper because the hob is forced into molten liquid, rather than massive iron. Shown at left are the tool steel hob (center), the beryllium copper cavity (left), and the finished zinc die casting (right). Courtesy Allen-Stevens Corp.

TABLE 1

The following hot work steels (ASM Class IV-B-2) will meet hob requirements:

Allegheny	Potomac
Bethlehem	Cr-Mo-W
Braeburn	Pressurdie #2
Carpenter	#345
Crucible	Chro-Mow
Disston	#873
Firth Sterling	HWD #1
Jessop	Dica B
Latrobe	LPD M.G.R.
Univ-Cyclops	Thermold B
Vanadium	Hot Form #1
Vulcan	T.C.M.

Much of the material presented here is contained in a data book, "Tru-Cast Beryllium Copper," [1] along with reports from two die casting plants.

How the cavities are produced

Contrary to the usual methods of hobbing, these cavities and cores are produced by pouring the alloy around a master steel hob and immediately applying pressure while the alloy is still in the molten state.

This allows the metal to flow evenly into the details of the hob and assures fidelity of definition. It also permits casting of cavities that could not otherwise be hobbed in steel without severe hob replacement.

An air hardened steel hob (See Table 1) can be used to produce as many as 50 cavities having finish commensurate with that on the original hob surface. Shrinkage of the beryllium copper alloy during casting is .004 per inch regardless of mass. By taking this factor into account when machining the master hob, dimensional accuracy as close as ±.001 is said to be achieved.

Generally considered age hardening, beryllium copper nevertheless does not age at room temperature but requires artificial processing. Cavities have been used for die casting zinc in both the as-cast and "age hardened" conditions, although a .0003-.0005 flash plate of chromium is recommended by Manco Products. It is advisable to put a substantially heavier chrome plate on the gates of the die to maintain a minimum of die wear.

Cavities to be hardened are first solution annealed in an air circulating or muffle type furnace at 1450-1475 F for about three hours and then quenched in cold running water.

For hardening, they are placed in a cold furnace and the temperature brought up to 650 F, held for three hours at temperature, and then cooled in still air. Effects of heat treatment upon properties of beryllium copper alloy are indicated in Table 2.

Beryllium copper as a die material

Beryllium copper is basically a tertiary alloy consisting of contained amounts of from .5-3 percent beryllium with either cobalt or nickel and the balance copper. Presence of the third element adds granular refinement. After heat treatment, the cavities have a uniform hardness from case to core and not just a case hardness.

In considering the use of beryllium copper for die cavities four factors are weighed: 1) How well can detail, surface quality and accuracy be obtained? 2) What kind of service life will the cavity produce? 3) How does cost compare? 4) What effect will it have upon the actual casting operation? In addition, what are considerations relating to speed of delivery, problems of maintenance and storage, and requirements of the master hob?

Surface detail is one of the major advan-

continued next page

[1] Published by and available free from Manco Products, Inc., Melvindale, Mich., producers of beryllium copper die and mold cavities.

TABLE 2

EFFECT OF HEAT TREATMENT ON THE PROPERTIES OF BERYLLIUM COPPER

Condition	Tensile Strength p.s.i.	Tension Impact (ft. lbs.)	Rockwell Hardness	Thermal Conductivity % I.A.C.S.	Elongation % in 2 in.
As cast	105,000	12	C7/C12	20	2
Cast and Solution Annealed	80,000	8	B45/B55	10	2
Solution Annealed and Heat Treated	170,000	3	C40/C45	25	2

SMOOTH CAST SURFACE on this automotive zinc die casting is obtained from the beryllium copper die cavity in which it has been produced. Minimum surface conditioning is required prior to plating.

tages of this type of cavity, since the molten alloy is forced by pressure against the hob surface. Exact reproduction of the hob surface is obtained and dimensional tolerances as mentioned above are secured.

How well this definition is transferred to the zinc die casting depends somewhat upon the casting cycle. The high thermal conductivity of beryllium copper causes the cavity to lose heat rapidly, often eliminating need for water cooling. One Michigan die caster has expressed the opinion that a faster cycle of operation is necessary to maintain the die at most effective temperature, especially when casting thin-walled pieces where uneven chilling of the surface would be harmful. This die caster has utilized the cavities successfully for small automotive castings requiring subsequent chromium plating.

Another die caster, the Allen-Stevens Corp. of Jamaica, N. Y., has reported a pair of cavities which had produced, as of March 1952, more than 300,000 shots and show no appreciable wear. This company's estimate is that the cavities will pass the million-shot mark in serviceable condition provided normal care is taken of the dies.

From Albert Sanders of Allen-Stevens Corp., the following opinion has been received, "The greatest advantage of using beryllium copper is the lesser force which is necessary in the process of forming a cavity. This means that there is less chance of damaging the hob, and that delicate, assymetrical and built-up hobs that were previously impractical can now be used.

"In addition, the cavity follows the hob much more faithfully so that the problem of cavity walls moving away from the hob is eliminated. Further, there is no longer any difficulty in making the metal in the cavity flow upward where a convex shape is desired.

"Other advantages are that there is less metal to remove from the outside of the cavity because it is cast closer to the desired shape. The cavity can be heat treated to be hard all the way through. This compares with merely case hardening the cavity which is usually all that can be done because our cavities are complex and must be done in a soft hobbing iron rather than a hardenable steel."

One disadvantage reported is that heat treatment of the beryllium copper, although quite simple as described above, is unfamiliar to many heat treaters. This, of course, is an easy problem to overcome. No trouble is mentioned with regard to soldering, heat checking or erosion.

An Ohio die caster who has used the process for plumbing fittings is reported to have produced aluminum die castings in beryllium copper cavities, but no production results are available.

Costwise, beryllium copper cavities compare favorably with hobbed steel cavities but their economy does not become apparent until they are at the machining stage preparatory to being fitted into the die. Due to the method of custom fabrication, there is an elimination of machine hours and bench time in readying the cavities for the die shoe.

Maintenance and storage of a beryllium copper cavity requires no special consideration. Since the alloy is non-corroding, it is not necessary to lubricate the surfaces to prevent rust.

Requirements for the master hob

The master hob is supplied by the customer from an air hardened steel because during casting, the hob must be able to withstand simultaneous heat and pressure. Any steel having a high draw, 1100 F or more, which will maintain a hardness of Rockwell C53/C58, can be used.

The hob base should be about 2 inches thick with several ½" —13 holes drilled and tapped in the under surface at bearing points to provide means of fastening to a stripper plate. The master hob should be hardened to Rockwell C55/C58 and polished. A taper of 2 degrees is necessary on working surfaces and 5 degrees on letters or numerals.

The hob base is made about ⅛ inch larger on length and width than the finished cavity desired. The cavity is cast to the size of the hob base and then machined to finished size for insertion in the die block

AMERICAN DIE CASTING INSTITUTE TO HOLD ANNUAL MEETING

FEATURING four major panel discussions on special phases of die casting practice, the American Die Casting Institute will gather in Chicago September 17 and 18 for their annual business and technical meetings.

The two-day sessions are expected to attract the major die casters who will discuss common technical and business problems. Highlight of the meetings will be the annual banquet and presentation of the Doehler Award for "the outstanding achievement contributing to the advancement of the die casting industry."

The four panel discussions, speakers for which have not yet been announced, will cover the following topics :1.) Metal flow characteristics in die casting dies; 2.) The growing use of statistical quality control by industry and the production problems involved; 3.) A cost accounting panel on zinc vs aluminum die castings including metal cost, casting cost, machining and trimming cost, plating and painting and comparable total costs; and 4.) Safety practices and procedures.

Election of officers for 1953 will be an important item on the business calendar. Present officers are: Austin Lillegren of Madison-Kipp Corp., president and G. M. Rollason of Aluminum Company of America, vice president.

Board of directors include: Arthur G. Chase of Precision Castings Co., Inc.; Thomas J. Walker of Mt. Vernon Die Casting Co.; G. M. Rollason; H. H. Weiss of Superior Die Casting Co.; George Ralls of Pressure Castings, Inc.

Also, R. A. Luedtke of Shultz Die Casting Co.; Austin Lillegren; Fred Schroeder of Milwaukee Die Casting Co.; Charles G. Adams of Twin City Die Casting Co.; A. W. Simpson III of Western Die Casting Co.; J. M. Davis of Union Die Casting Co.; Paul Berndt of Harvill Corp.; and A. J. Sanford of Cleveland Hardware and Forging Co. (ex-officio). Secretary of the Institute is David Laine of New York.

The annual Doehler Award which will be presented at the banquet Wednesday evening, was first given in 1950 to C. R. Maxon of New Jersey Zinc Co. for his work in gaining acceptance for zinc base die casting alloys by the U. S. Army Engineers in the Canal Zone. Last year the award went to the 3-man committee of the Institute for its Safety Manual for the Die Casting Industry.

Pressure-tight bronze INVESTMENT CASTINGS

THE PRODUCTION of non-ferrous castings to be used at high pressures has always presented serious problems. When sand cast, a relatively high degree of porosity is the order of things rather than the exception. This high porosity of sand castings becomes particularly troublesome when it is necessary to do some machining on the part and thus remove the "skin."

The pump housing, right, cast in silicon bronze by the Rode Co., of Woburn, Mass., illustrates admirably a case where investment casting has solved the porosity troubles, common in sand castings.

When non-porosity is coupled with complex coring as it is in this case, the use of investment casting as a manufacturing method allows very substantial savings to be made.

As delivered by the foundry, this pump housing needs only have the drive shaft reamed to bring it to size and the two faces lapped to provide a good joint between the housing and the mating parts.

Through the use of investment casting there has been a marked economy due largely to decreased rejections and somewhat lowered machining costs. Scrap loss due to necessary metal removal during machining has also been reduced.

PART TWO

Technology of pre-alloyed STAINLESS STEEL POWDERS– properties, production, uses

by

ARTHUR H. GROBE, Research Metallurgist

GEORGE A. ROBERTS, Chief Metallurgist

Vanadium-Alloys Steel Company
Latrobe, Pennsylvania

(Editor's note: Part One of this article containing data on production, properties and applications appeared in July PMM.)

COMMERCIAL pressing and sintering of each of these stainless steel powders has proven practical. Typical parts currently in production are pressed between 30 and 50 t.s.i. and sintered in deoxidized, dried hydrogen or cracked ammonia at temperatures of 2200-2350 F. with sintering times of 30 minutes to 1 hour at temperature (4). The parts are cooled in this atmosphere, usually in the cooling zone of the furnace, and then removed to the natural atmosphere at or only slightly above room temperature.

Subsequently they may be handled in a number of ways to achieve the desired combination of working properties or characteristics. Thus, they may be passivated by immersion in acid baths to enhance their corrosion resistance, may be oil vacuum impregnated for use as bearings (stainless steel compacts may be run in sliding contact with other stainless articles without the galling or seizing characteristics typical of conventional stainless parts), or they may be coined, or coined and re-sintered for additional strength, ductility, or density.

Hundreds of mechanical property tests have been made on test bars made from the five stainless steel powders described. While it is impossible to reproduce all of these properties here, a summary has been prepared in Table 3 listing typical values from certain standard pressing and sintering conditions.*

For each type the tensile strength and elongation, and the final density have been recorded after each of the following handling cycles:

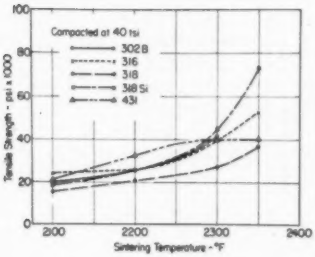
1.) Pressed at 40 t.s.i., sintered for 45 minutes at 2200 F.

2.) Pressed and coined at 40 t.s.i. Double sintered for 45 minutes at 2200 F. each time.

3.) Pressed at 40 t.s.i. and sintered for 45 minutes at 2300 F.

4.) Pressed and coined at 40 t.s.i. and sintered, and re-sintered for 45 minutes at 2300 F. each time.

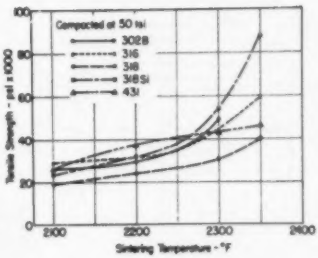
*A more complete listing of the properties for Type 302B Stainless Steel Powder has been published (5).



6. TENSILE strength versus sintering temperature for the five —100 mesh stainless steel powders compacted at 40 t.s.i. All compacts were sintered for 45 minutes at temperature in dry hydrogen.

type 318 gives consistently lower tensile strengths at all temperatures; at low sintering temperatures the highest strengths are obtained with type 431; at sintering temperatures of 2300 F. or higher, types 318 Si, 302B, and 316 show a significant increase in strength, exceeding that of 431. Type 431 should not, in general, be sintered above 2200-2250 F. Higher sintering temperatures do not provide sufficiently increased strength to be justified.

There is a definite relationship between the tensile strength and elongation of sintered stainless steel compacts, as shown in Figure 9. The grades divide themselves basically into two groups, with types 316, 318, and 302B providing higher elon-



7. TENSILE strength versus sintering temperature for the five —100 mesh stainless steel powders compacted at 50 t.s.i. All compacts were sintered for 45 minutes at temperature in dry hydrogen.

gation values at equivalent tensile strength levels. However, the elongation values shown for types 318 Si and 431 are higher than those normally achieved in

continued next page

5.) Optimum properties for powder usually achieved by double pressing at 50 t.s.i. and double sintering at 2300 or 2350 F. These optimum values are indicated by an asterisk for each grade in Table 3.

Tensile bars for determining these properties were made in a lubricated split die, producing a square-ended specimen 4" by ¼" thick. The width at each end was ⅜", with a reduced center section ¼" wide, to provide a gauge length of 1". Coining or re-pressing, when utilized, was performed in the same dies.

Charts shown as Figures 6 and 7 supply additional information on the relationship of sintering temperature and compacting pressure to the resulting tensile strength. Figure 6 refers to all grades of —100 mesh powder initially compacted at 40 t.s.i. and sintered for 45 minutes, while Figure 7 applies to an initial pressure of 50 t.s.i. with an identical sintering cycle.

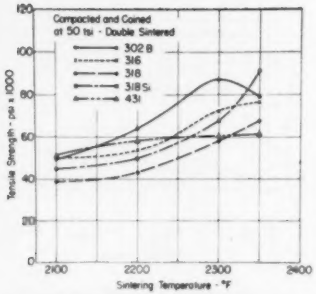
Figure 8 relates tensile strength to sintering temperature for all powders after double pressing at 50 t.s.i. and double sintering for 45 minutes at the indicated temperature. From these charts one observes that

TABLE III

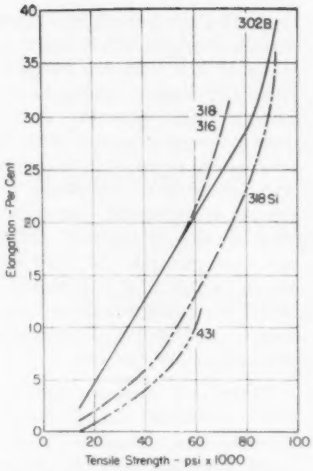
SINTERED PROPERTIES OF VASCO STAINLESS STEEL POWDERS -100 MESH POWDER

Type	Compacting and Coining Pressure t.s.i.	Sintering and Re-sintering Temperature ° F.	Tensile Strength p.s.i.	Elongation Pct. in/in.	Final Density gms./c.c.
302B	40-0	2200	25,500	8	5.59
	40-40	2200-2200	54,000	20	6.23
	40-0	2300	41,500	15	5.90
	40-40	2300-2300	74,500	26	6.49
	*50-00	2300-2300	87,000	32	6.79
316	40-0	2200	25,500	8	5.77
	40-40	2200-2200	46,500	18	6.37
	40-0	2300	39,500	13	6.02
	40-40	2300-2300	60,500	20	6.60
	*50-50	2350-2350	76,000	31	7.00
318	40-0	2200	20,500	2	5.89
	40-40	2200-2200	35,500	4	6.53
	40-0	2300	27,000	7	5.91
	40-40	2300-2300	49,500	16	6.64
	*50-50	2350-2350	67,500	28	7.01
318 Si	40-0	2200	25,500	3	5.61
	40-40	2200-2200	39,500	5	6.20
	40-0	2300	45,000	7	5.95
	40-40	2300-2300	62,000	16	6.50
	40-40	2350-2350	92,000	31	7.00
	*50-50	2350-2350	91,000	36	7.15
431	40-0	2200	32,500	3	5.53
	40-40	2200-2200	48,500	7	6.05
	40-0	2300	37,500	3	5.79
	40-40	2300-2300	53,000	8	6.21
	*50-50	2300-2300	60,500	10	6.42

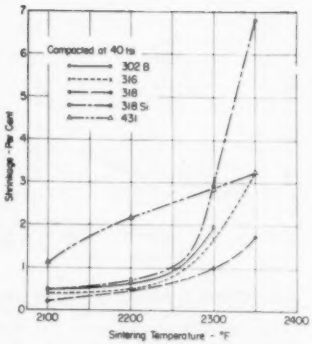
Sintering and re-sintering times — 45 minutes at temperature
*Optimum properties for each grade using -100 mesh powder



8. TENSILE strength versus sintering temperature for the five —100 mesh stainless steel powders compacted and coined at 50 t.s.i. All compacts were double sintered for 45 minutes at temperature in dry hydrogen.



9. RELATIONSHIP between elongation and tensile strength for the five —100 mesh stainless steel powders after all types of pressing and sintering treatments.



10. SHRINKAGE versus sintering temperature for the five —100 mesh stainless steel powders pressed at 40 t.s.i. and sintered for 45 minutes at temperature.

the cold pressing and sintering of ferrous base alloys and this significant fact promises to expand the field of application of powder metallurgy methods.

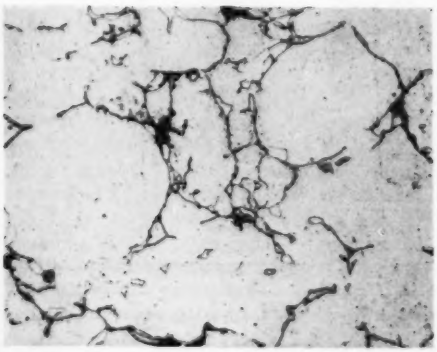
Particularly can articles be made more porous with some retention of ductility combined with excellent corrosion resistance. It should be noted that while type 318 gives the lowest tensile strengths (see Figures 6-8), it is capable of high ductility equivalent to that of 316 and 302B at equivalent tensile strength levels.

The shrinkage of stainless steel compacts during sintering is quite low and controllable at temperatures of 2300 F. or below. Shrinkage data for samples initially pressed at 40 t.s.i. are shown in Figure 10 as a function of sintering temperature. The shrinkage of all of the high nickel steels is almost identical and less than 1 percent at sintering temperatures up to 2250 F. At higher temperatures the shrinkage increases rapidly. Shrinkage for type 431 is consistently higher at temperatures under 2300 F. The different shape of the curve for 431 is probably related to the fact that it is entirely ferrite and not austenite with increasing amounts of ferrite, as in the high nickel grades.

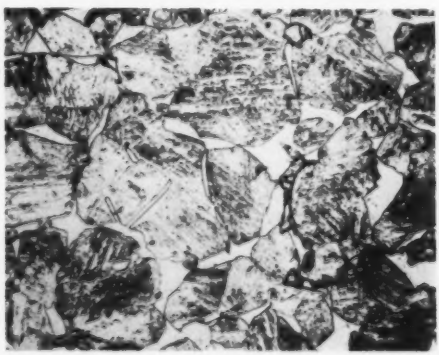
Microstructural examination of these sintered 302B stainless steel compacts reveals that at 2200 F. and higher sintering temperatures ferrite is forming at grain boundaries. The amount of ferrite increases as the sintering temperature is raised as is shown in Figures 11 and 12. This ferrite is the result of the high silicon content of the pow-

continued on page 78

11. TYPE 302B STAINLESS steel powder pressed at 30 t.s.i. and sintered for 45 minutes at 2200 F. 500X



12. TYPE 302B STAINLESS steel powder pressed and coined at 50 t.s.i. and double sintered for 45 minutes at 2300 F. each time. Sample taken near tensile fracture shows effect of deformation on matrix structure. 500X



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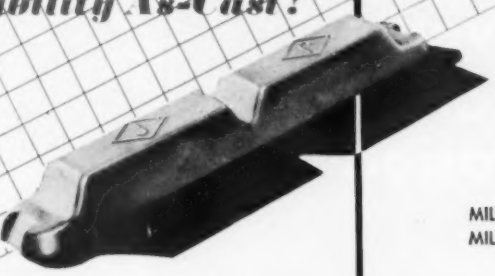

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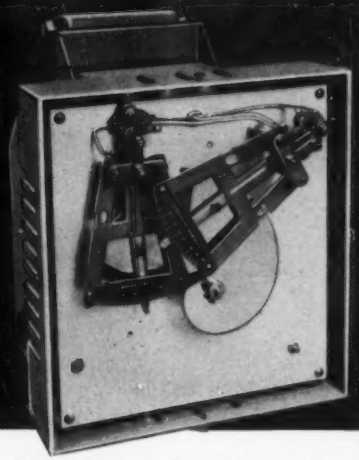

CASE HISTORIES FROM MT. VERNON FILES

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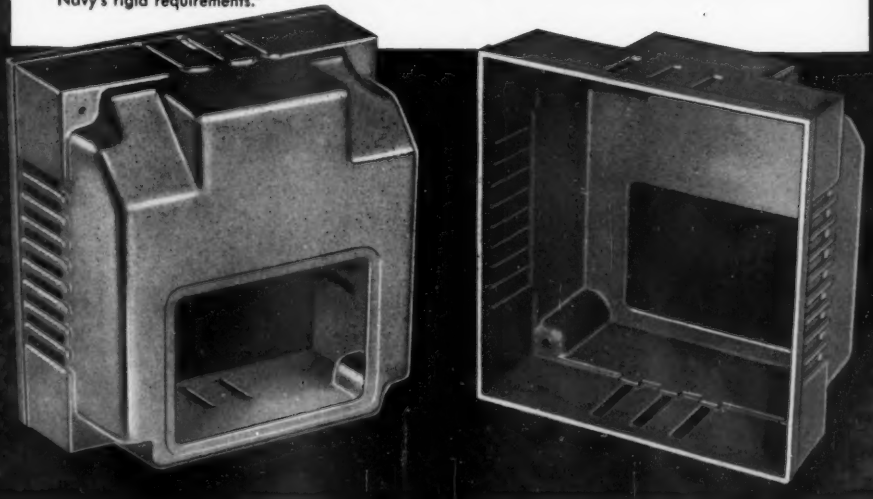


Techniques for melting ALUMINUM

Two-chamber melting furnace overcomes problems caused by adding cold metal to molten bath

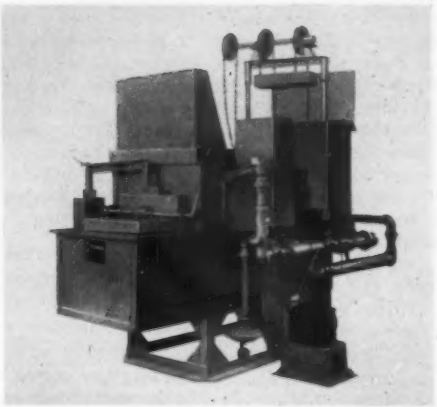
By J. L. STROMAN*

THE rapid increase in the use of aluminum in recent years has necessitated better methods of melting and handling of the metal than employed in the past.

The Stroman "DC" double chamber furnace, a new design shown in Figure 1, is the result of a great deal of study and experimental work in our plant and in the field, working with plants that specialize in casting this metal. The furnace is developed to meet known conditions and peculiarities of the alloys regardless of whether cast in sand, permanent mold, die cast or reclamation.

For many years, it was an accepted opinion that to produce good aluminum castings it was necessary to melt the metal in either an iron pot or a crucible furnace in order to keep the metal from direct contact with the products of combustion preventing gas pick-up, resulting in porosity in the castings. This theory, we believe, is erroneous. As a result, we ship far more open flame reverberatory furnaces from our plant today than we do crucible or iron pot furnaces.

*Vice President Stroman Furnace & Engineering Co.



1. USE OF TWO CHAMBERS is a feature of new furnace designed for aluminum melting.

In our opinion, perhaps the principle cause of porosity in castings is due to submerging either cold or room temperature metal into a molten bath. Unless the metal is thoroughly dry it will have moisture on the surface, generally referred to as capillary moisture which is carried into the bath, resulting in porosity. The two-chamber Stroman furnace completely eliminates this possibility.

Another cause of porosity in castings, is overheating of the bath. This takes place in any type of furnace whether it is of the reverberatory type, crucible,, or iron pot and with any type of flame.

Someplace around 1400 degrees, aluminum picks up gas and the foundryman should do all possible to cast the metal at temperature below this point, if he is after gas-free castings, even if pattern changes are required.

We also are of the opinion that a certain amount of dross, at least a small amount, in the holding furnace is beneficial.

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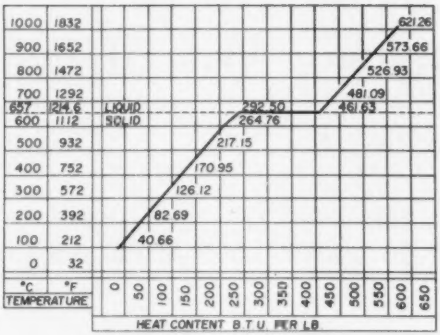


2. HEAT CONTENT OF ALUMINUM is illustrated by this chart showing that 90 percent of the applied heat is utilized bringing the metal up to casting temperature.

However, this dross must be of a certain type; it must be dry and not a glossy or wet type. This holding chamber in this furnace provides dry, fluffy type dross. With this in mind, the Stroman two-chamber furnace was developed to eliminate the moisture in the metal before it is melted, to prevent overheating of the molten bath and provide the proper type of dross covering over the metal in the holding furnace and, also, to eliminate hot charging in permanent mold and die casting plants.

The chart, Figure 2, shows the heat content of aluminum. From this it will be noted about 90 percent of the heat required to bring aluminum up to a casting temperature is in the melting, and only 10 percent after it is in a molten stage. It requires about 450 BTU's per pound to bring solid metal up to tne liquid state at a temperature of slightly over 1200 degrees and to raise it to approximately 1350 degrees, a normal casting temperature, it requires only about 50 additional BTU's. From this, we reason that the melting of aluminum is a two-furnace proposition: one to break it down and one to hold it, with each furnace having it's own individual burner equipment of the proper size.

In a one-chambered furnace, it is necessary to have burner equipment 8 to 9 times greater than actually required after the metal is up to a casting temperature. Burner equipment that does not have turn-down possibilities cannot hold the metal at the casting temperature without overshooting.

The cross section drawing of the "DC" furnace, Figure 3, shows that it is composed of two separate furnaces combined in one complete unit—one is for holding the metal after it has been melted or broken down and the other for melting only. In the melting furnace there is no bath, or, at least if there is, it is a very small one. The flame is allowed to surround the material completely to drive out the moisture before it melts and runs into the holding furnace.

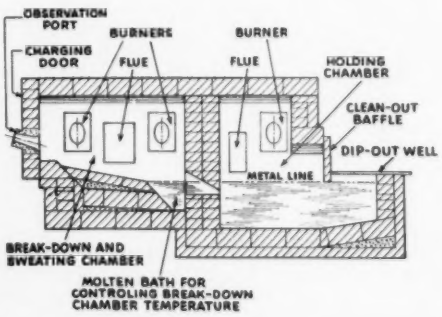
The metal will flow into the holding furnace at a temperature between 1160 and 1180 degrees, below the temperature where there is danger of gas pick-up.

Both of these chambers are automatically controlled to eliminate the human element. The metal in the holding furnace can be controlled with ±10 degrees due to the fact that it is constantly fed from the melting furnace with metal at a constant temperature. Since uniform temperature is often of great importance, it is necessary that both chambers be controlled; the melting chamber as well as the holding chamber.

Another very desirable effect developed which was not considered at the time this furnace was developed and that is that it eliminates hard spots in the molten bath and it can be held day-in and day-out in the holding furnace without ill effect and since it requires so little fuel to hold it overnight. In many cases it is desirable to do so rather than to tap out the metal, cast it into ingot, and start all over in the morning.

continued on page 80

3. CROSS-SECTION diagram reveals construction of furnace and relationship between two chambers.



NOMINATE ASME OFFICERS FOR 1953

The nomination of Frederick S. Blackall, Jr., president and treasurer of the Taft-Peirce Manufacturing Co., of Woonsocket, R. I., as 1953 president of The American Society of Mechanical Engineers, has been announced by the society. Mr. Blackall heads a slate of new ASME nominees, including four regional vice presidents and two directors-at-large, submitted by the society's nominating committee. Since only one name is presented for each office, nomination is tantamount to election.

Election will take place in the Fall by letter ballot of the membership of over 35,000 engineers. The new officers will begin their terms at the conclusion of the ASME annual meeting next December. Mr. Blackall will succeed Reginald J. S. Pigott, director of the engineering division of Gulf Research & Development Co., of Pittsburgh, a subsidiary of Gulf Oil Corp.

Regional vice presidents nominated are: Henry R. Kessler, (renomination) manager, Republic Flow Meters Co., New York, N. Y.; Paul R. Yopp, district sales manager, the Babcock & Wilcox Co., Atlanta, Ga.; Ben George Elliott, professor of mechanical engineering, University of Wisconsin, Madison, Wis.; Harry R. Pearson, personnel director, Dallas Power and Light Co., Dallas, Tex.

Nominated as directors-at-large: David W. R. Morgan, vice president, Westinghouse Electric Corp., Philadelphia, Pa. and Ralph L. Goetzenberger, vice president, Minneapolis-Honeywell Regulator Co., Washington, D. C.

CORRECTION

Due to an error in copy reading, an announcement appearing on page 66 of June PMM reported that Harry Spaet had joined the staff of Precision Castings Company in the capacity of sales manager. Actually, Mr. Spaet will serve as sales engineer out of the Chicago office of Precision Castings.

POWDERMET SUCCESS STORY NO. 12

THE GEAR THAT COULDN'T BE MADE!

Designers specified powdered metal for this two inch helical gear to avoid the high cost of production by conventional methods. But the combination of helical gear teeth with the axial elements of the clutch collar presented an unusual problem in powdered metal fabrication.

That's why they came to Powdered Metal Products Corporation of America . . . the gears, made from a special bearing bronze in production quantities, cost less than fifty cents each!

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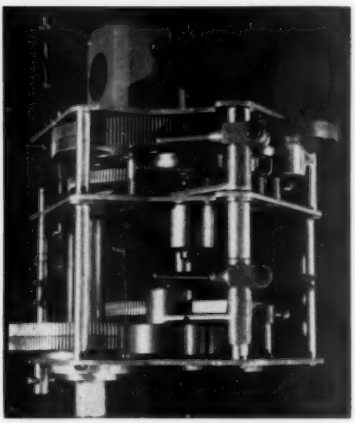

DIE CASTINGS mount and protect gear mechanisms

1. PRECISION GEAR TRAIN built to withstand extra rough usage is revealed in this stripped-down view of the gyro tripod mechanism. It controls the speed of the camera and prevents too rapid or uneven movement.

CARL AKELEY, hunter and photographer of African big game, world famous taxidermist, and originator of the habitat group method of museum displays, was impatient with existing methods and equipment if they failed to produce the quality of product he demanded.

Because of the clumsiness and slowness of existing motion picture equipment, Akeley missed many animal pictures in Africa. The loss of these pictures led him to design better field equipment for photographing animals in their natural haunts. There have been many changes since the development of his first motion picture camera, but the equipment being made today by the Akeley Camera and Instrument Corp. of New York is basically the same as that for which Mr. Akeley was awarded a medal by the Franklin Institute for his outstanding service to the motion picture industry.

The gyro tripod which enables fast setups and uniform rates of panning and tilting is described in part in the following report.

Die cast housing forms ball and socket

The gyro mechanism of the tripod head is shown in Figure 1. While this might not be classed as a particularly delicate piece of equipment, it does contain a number of very precisely cut gears and several friction drives. To operate smoothly and easily, this mechanism must be protected from dust, dirt and grit. The fast leveling swivel is a large ball and socket which must also be protected from dirt. Both the gyro mechanism and the ball and socket must further be protected from damage due to accidental bumps. To secure the necessary properties at both minimum cost and with a minimum of machine hours, an aluminum die casting is used for the tripod head, and the lower control housing, Figure 2. These two parts operate together to form the ball and socket swivel while the gyro mechanism is mounted in the lower control housing.

All of the ribbing needed to give adequate strength and rigidity has been incorporated in these castings as have all of the needed mounting appurtenances. Secondary machining is low considering the functional characteristics required. Some small holes have to be drilled and tapped, the center hole must be bored to secure the sizing required and the flanges are faced.

Both of these castings as well as the felt retaining ring, Figure 3, are made by the Newton-New Haven Co., of New Haven, Conn. This latter casting, the felt retainer, is in an excellent

example of ability of the die caster to produce a finished part.

The ring is about six inches in diameter and less than one-half inch wide with a section of only 1/16. The four holes are cored by the foundry, including the counter bores. The chief problems in connection with production of this casting are to maintain flatness and adequate smoothness of the inner surface. Both of these requirements have been met by the foundry.

The tilt table shown in Figure 4 is also a die casting of rather unusual complexity. Flatness and extreme rigidity of the table top are required. Since a rather heavy camera is mounted on the table and considerable associated equipment that must be held in accurate relation to the camera, precise location of mounting holes and lugs as well as extreme rigidity are essential.

Secondary machining operations are reduced to a minimum due to the close tolerances that are held in the manufacture of the table. A few small holes have to be drilled and tapped and the center hole must be bored. Only two holes require reaming, these are for the cross axle on which the table tilts. This aluminum casting is made by the Doehler-Jarvis Corp. of Toledo, Ohio.

Other die castings used in the gyro head tripod are the leg sockets shown in Figure 5. This casting, made by Newton-New Haven Corp. is used substantially as cast. One small hole is drilled and tapped to accommodate a steel tip. Other than this operation, only tumble polishing is required.

The fly wheel brackets, Figure 5, serve to mount and sup-

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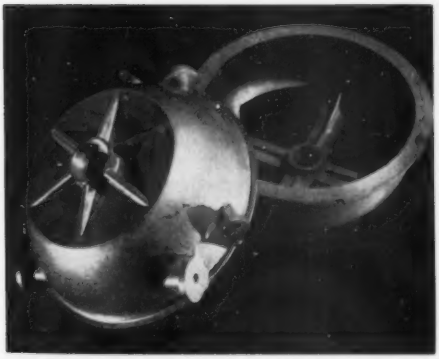
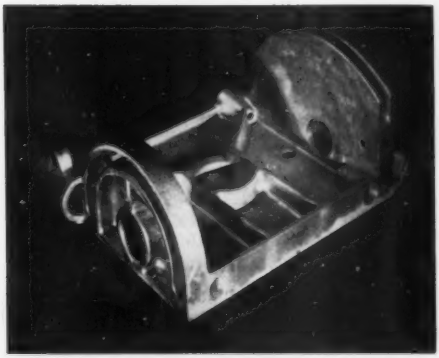


2 BALL-AND-SOCKET joint built of die castings is incorporated into the camera head. Fastening for legs and lower housing are also provided.

3. THIN-WALLED ring-shaped die casting six inches in diameter saves metal loss of stamping, and is cheaper and more accurate than sand casting.



4. MINIMUM SECONDARY operations are required by this complex-shaped tilt table which is die cast to close flatness tolerance.

5. EXCEPT FOR TUMBLING and minor polishing, the tripod leg socket (left) and fly wheel supports can be used as furnished by the die caster.

port the fly wheels that act as stabilizers of the gyro mechanism. In addition to supporting the wheels, they act as swivels to enable the fly wheels to be thrown in or out of service. As cast by the Superior Die Casting Co. of Cleveland Ohio, the brackets are polished by tumbling and then used without further secondary operations.

All of the parts described represent sound constructive uses of aluminum die castings where the flexibility and cost reducing features of the die casting process are utilized fully and the strength and light weight of aluminum are successfully utilized; Carl Akeley would have liked this tripod.

SOLDERING ALUMINUM TO ZINC BASE DIE CASTINGS

In the current issue of "Technical Advisor" published by The Reynolds Metals Company, an interesting question-and-answer department brings up the subject of whether or not aluminum can be soldered to zinc base die castings.

The method of accomplishing this suggested by the Reynolds publication is "First tin the die casting. An alloy of cadmium (82.5 percent) and zinc (17.5 percent) is recommened for this application. It melts at 510 F.

"Tin the aluminum . . . With both surfaces tinned, it is not difficult to complete the joint."

ANNOUNCE ETHYL SILICATE PRICE REDUCTION

Union Carbide and Carbon Corp. has recently announced a price reduction on condensed ethyl silicate. Used in the investment casting industry as a bonding agent for the investment materials, ethyl silicate with more than 25 percent available silica helps to produce the smooth flawless surfaces common to investment castings. In view of the growing demand for investment castings, this price reduction to 47.5c per pound in drum carload lots is particularly timely.

Exactly

To Your Specifications . . .

GEARS of POWDERED METAL

Illustrated are but a few of the many types of gears which are being produced by Michigan Powdered Metal Products Company. Each has proved highly successful for its specific application . . . and each has made possible substantial savings in the cost of assembled finished products.

As one of the pioneers in the field of powder metallurgy, this company has been responsible for the development of many of the most advanced methods of producing powdered metal parts of all kinds. In the processes employed here, there is the most accurate control of density, porosity, dimensional tolerances and surface finish. When required, strength equivalent to that of mild steel can be provided—an important factor in gear production in particular.

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Write for this bulletin describing our facilities and the scope of our powdered metal parts production.

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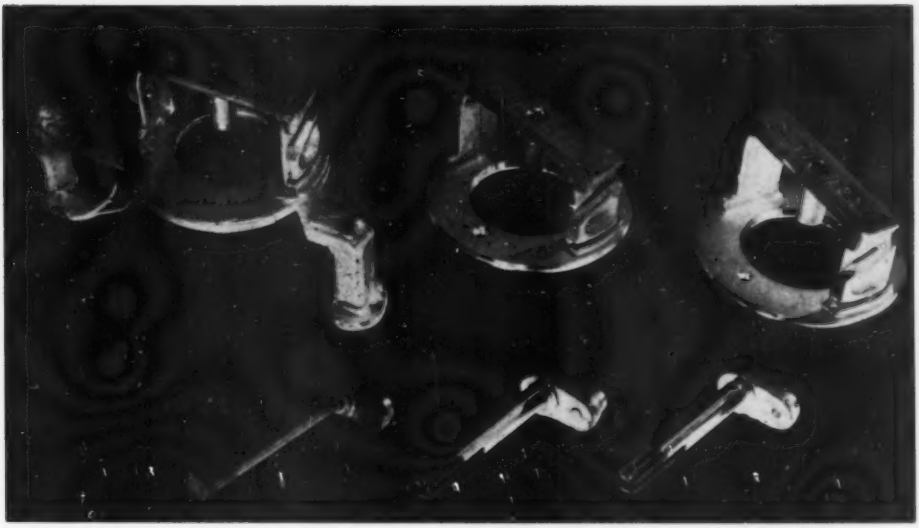

1. **THREE STAGES** in finishing copper-base permanent mold castings are illustrated. The yellow brass stopper body, above, is shown as cast, as machined and abrasive blasted, and as electroplated. In the foreground are views of the aluminum bronze trip lever casting as cast, as machined and as plated.

3 Copper Alloys used in PERMANENT MOLD CASTINGS and DIE CASTINGS

TOO few design engineers appreciate the range of copper base alloys that are being die cast and permanent mold cast on a production basis today. A few years back, it was felt that the relatively short die life when casting copper alloys in steel molds made it uneconomical to produce any but the exceptional pieces by these methods. Rising labor costs for secondary machining and finishing have changed the picture so that it is now distinctly practical in many instances to replace rough sand castings with pieces produced by one of the precision casting techniques, even though tooling costs are likely to be higher.

The number of alloys available for these processes has been expanded steadily until now there are brasses and bronzes which afford a variety of physical properties to suit the majority of requirements. The accuracy of dimension and high quality surface finish obtainable are such that parts in the as-cast condition may be considered to be finished or semi-finished components.

An example of the way a design engineer can utilize the advantages of these two casting processes, while selecting two or more copper base alloys to meet specific design needs, is the garbage disposal units whose component permanent mold and die castings are displayed in the two accompanying illustrations.

All of these pieces are produced by Pressco Casting & Manufacturing Company of Chesterton, Ind., who specialize in die cast and permanent mold cast copper base alloys.

The alloys selected for these castings include a 60-40 brass permanent mold casting, an aluminum bronze permanent mold casting, a 60-40 brass die casting and a silicon bronze die casting

The stopper body for a disposal unit shown in Figure 1 is a yellow brass permanent mold casting with an analysis of 59-60 percent copper, 40 percent zinc and .5 percent maximum aluminum.

continued next page

Like a great deal of plumbing hardware, this piece is exposed to corrosive materials, water, perspiration, abrasion and considerable wear on certain surfaces. The brass with tensile strength of about 40,000 psi, is a tough, corrosion resistant material which takes a plate well and yields a brilliant chromium plated exterior.

The cams on both sides would be impossible to reproduce accurately by sand casting, which reduces the choice of casting methods to either die or permanent mold casting. Due to the more expensive tooling which would be needed to die cast this piece, mainly because of core pulls, permanent mold casting has been determined to be less expensive.

The lettering for the word "Stopper" is stamped onto the top surface, since it isn't possible to obtain lettering detail as sharp by permanent mold casting as that normal for the die casting process. Otherwise, permanent mold casting is the best way to reproduce the casting.

The piece is shown in Figure 1 as cast with gate still attached, as machined, and as chromium plated ready for assembly. Cycle of operations on the casting includes:

1. Cut off gates and risers.
2. Grind face on wheel.
3. Disc grind base.
4. Abrasive blast all over.
5. Stamp lettering.
6. Face and turn in a single setup.
7. Drill and counterbore holes

In order to produce a satisfactory casting in this alloy, high purity metals must be used. Pressco does its own alloying because impurities beyond the specified limits affect fluidity.

The high strength characteristics of aluminum bronze has been a factor in selecting that alloy for permanent mold casting used as a trip lever, also shown in Figure 1. While it is still necessary to perform several machining operations on this piece including a hollow milling and deep slotting cut, it is still more practical and less expensive produced by permanent mold.

In addition to the two operations mentioned above, it is also

continued on page 78

2. DETAIL obtainable by die casting is illustrated with these brass and silicon bronze die castings for a waste disposal unit.

Here's a fellow who can afford to strut; he's right out in front. That's an enviable spot for any business or product, as well. Holding that spot demands constant attention to every detail.

Many industrial leaders have discovered that the proper use of die castings has been a major factor in their success. Have you considered the design advantages and manufacturing economies of Badger Die castings for your product?

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Characteristics of nickel-cadmium batteries produced by POWDER METALLURGY

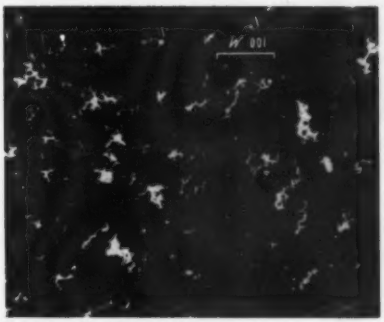
By C. BERG*

THE NICKEL-CADMIUM BATTERY was developed in Europe during the same period as the nickel-iron battery in this country. These two types of alkaline storage battery differ with respect to the negative active materials and certain construction details. Both types utilize perforated steel pockets or tubes for enclosing the active materials, thus eliminating the problem of shedding.

The pocket-type of nickel-cadmium battery has been in production in this country since 1945 at the Easthampton, Massachusetts, plant of Nickel Cadmium Battery Corp.

During the late twenties, I. G. Farbenindustrie of Germany experimented with porous sintered carbonyl iron and sintered carbonyl nickel plates for alkaline batteries. The development was climaxed by the manufacture of several types of nickel-cadmium batteries during World War II by Accumulatoren-Fabrik A. G., a leading German manufacturer of storage batteries. These batteries used sintered carbonyl nickel plates.

*Vice President & Chief Engineer Nickel Cadmium Battery Co.



1. TYPICAL CARBONYL NICKEL powder showing the chain-like structure, markedly different from the better known spherical particles characteristic of carbonyl iron. 100X unetched

The sintered plate battery differs from the conventional alkaline battery in that it has porous nickel plates which serve as the retainer of the active materials and as collectors and conductors of the current to the cell terminals.

The plaques are prepared by sintering carbonyl nickel powder. The powder is produced at present in England and is distributed by International Nickel Co. as grade B Inco powder. The photomicrograph, Figure 1, shows the typical chain-like clusters of carbonyl nickel powder, in marked contrast to car-

continued next page

2. PLAQUE made of carbonyl nickel, sintered and welded to a bus-bar. These plaques are used to carry the active chemicals of the battery.

Better DIE Lubrication by G W SMITH

from start

Die Slick No. 3 for difficult ALUMINUM or MAGNESIUM castings. Use full strength where there is trouble. Thin with mineral spirits or kerosene for spraying on dies. Aids parting and ejection, enables better metal flow and better fill-out of casting. Will not stain castings.

Die Slick No. 4 expressly for BRASS castings, sometimes used on aluminum and magnesium. Retains lubricity under high heat . . . used full strength or thinned with mineral spirits or kerosene. Contains lubricating graphite.

Die Slick No. 9 for ultra high "hardware" finish ZINC castings. No. 9 guarantees clean, spotless zinc castings ready to receive plated finishes without necessity of harsh pre-cleaning before the plating operations.

Die Slick No. 11. A general purpose ZINC castings lubricant. No. 11 is a heavy-duty lubricant that satisfies the most severe lubricating requirements for zinc castings. No. 11 is stain free *unless applied too heavily*. May be used full strength or diluted with mineral spirits or kerosene.

Standard Grade Die Slick is used on aluminum and magnesium castings as well as on lead and zinc. It is the general purpose die casting die lubricant for all casting work.

to finish

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die casting lubricants

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don't forget Plunger Slick

Plunger Slick is a specific lubricant for plungers on cold chamber casting machines. P. S. is an adherent, viscous grease that will not break down under heat or friction.

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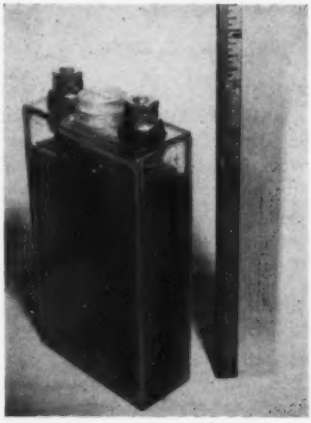
bonyl iron powder consisting of spherical particles with onion-layer structure.

The plaques are usually prepared in graphite molds by simply filling the mold cavity with powder without the application of compacting pressure as is common in the practice of powder metallurgy. A grid, usually of commercially pure nickel wire cloth is packed about in the middle of the powder in order to confer strength, to control the thickness and to eliminate distortion. The sintering is carried out for about



3. COMPLETED, SINGLE CELL, nickel cadmium storage battery. Note the small size compared with the better known alkaline battery of the same capacity.

10 minutes at 1600-1700 F in a dissociated ammonia atmosphere, and the cooling of the plaque and mold is usually in the same atmosphere.

A typical plaque with a bus-bar attached by spot-welding is shown in Figure 2.

The plaques have a porosity of 75 to 80 percent of which about 40 to 50 percent is utilized to retain active material introduced into the pores by an impregnation process. This process, used for both the positive and the negative plates, con-

continued on page 83

PMM

Finishing Section

SURFACE FINISHING

Most precision metal molded parts receive some type of surface finish such as plating, organic coating, anodic coating or chemical coating. This section includes information on the methods, processes and equipment used in these surface treatments.

A Section Devoted to Specialized Finishing of

Die Castings • Investment Castings • Powder Metal Parts
Permanent Mold Castings • Plaster Mold Castings

UNICHROME
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News about
COATINGS for METALS
Metallic . . . . . Organic . . . . . Decorative . . . . . Protective

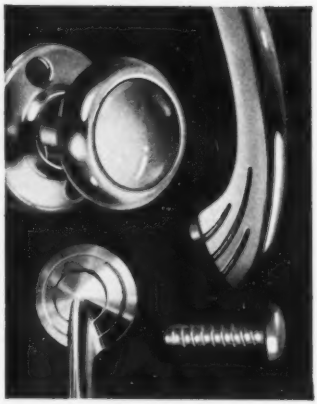
Brilliant Zinc Finish with extra life

in three easy steps

1. Plating in zinc bath

2. Treatment in Unichrome Clear Dip

3. Application of an "invisible," clear enamel



■ Combination finishes have come up as the answer for satisfactory bright finishing today – substituting for the plated finish which requires restricted nickel.

One such outstanding substitute is obtained by using only .0002" to .0005" of ordinary zinc plate and then following up by chemically treating the zinc in Unichrome Clear Dip. It is a fast, economical and easily controlled process, adaptable to manual or automatic operations. The results are startling. The plated steel or die cast product emerges from the solution bright as chromium. This Unichrome Dip Finish is integral with the zinc. It stays bright because of its good resistance to exposure, dulling, and finger-marking – thereby assuring for products not only the appeal of a bright plate but also great rust and corrosion resistance.

A COMPLETE SYSTEM

Application of a clear organic coating usually completes the finishing system. This final step is employed to assure the long service life expected of bright finishes.

Many Unichrome Clear Enamels were developed especially for use on plated or polished metals. They supply the adhesion and protective properties needed without detracting from brightness. A baked-on film of Unichrome Clear Coating B-115, for example, while virtually invisible, resists humidity, handling, discoloration and exposure. Where baking facilities are limited, Unichrome Coating A-140 is applied and then air dried or force dried to give results comparable in corrosion resistance to many coatings that are baked.

PROVED IN SERVICE

The combination of Unichrome Clear Dip and Unichrome Clear Enamel has been used with outstanding success for years on die castings, wire goods, ice skates, bicycle parts and other products and components. It proves that substitute finishes, properly fortified, can be durable and as attractive as the finishes replaced.

Full details for the asking – write or phone us.

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More production and fewer problems in hard chromium plating

Platers have found it easier to meet stepped-up production schedules with Unichrome S.R.H.S. Chromium. It speeds up plating time by 20 to 80%. It plates smoother, with less "treeing." This means less need for depositing excess chromium to allow for grinding and final finishing. With higher cathode efficiency, S.R.H.S. Chromium uses less power to deposit the specified chromium, thereby increasing capacity of existing equipment. It also assures top throwing power, minimized control and fewer rejects through its self-regulating feature.

STEADY POWER FOR PLATING OR ANODIZING

Power supplies such as Unichrome Selenium Rectifiers offer you an "edge" today. You get units built to withstand plating room conditions, in sizes from 250 to 10,000 amperes, and you get them fast. In short, no need for long delay, or costly installation of more capacity than you can use, or frequent maintenance.

Preventive maintenance saves replacement costs

Today's shortage of metals makes replacement of equipment a serious problem. Many plating plants are, therefore, putting greater emphasis on preventive maintenance. They find that using chemical resisting Ucilon* Protective Coatings on a regular basis avoids corrosion damage to equipment and thereby minimizes not only the need for replacement but also the costly downtime. Applied to structural work, too, Ucilon Coatings keep plants looking better longer and save on yearly painting costs.

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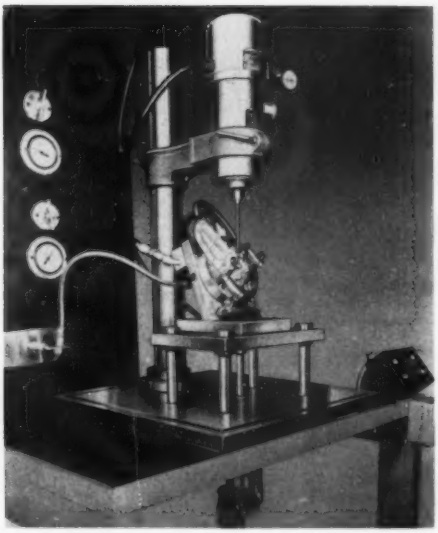
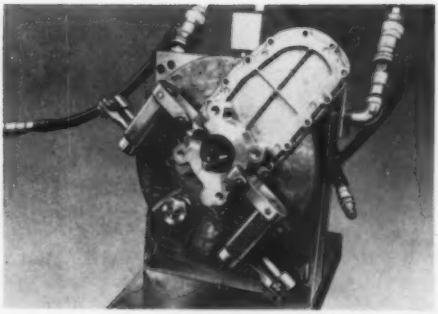




DRILL BREAKAGE DROPPED from 20 per thousand pieces, to 1 per thousand pieces with this setup which combines a Dumore automatic drill head and timer with air cylinders and electric controls. Increase in production rate has also been noted.

Here's how to drill small holes in DIE CASTINGS

THE Wm. R. Whittaker Company, Ltd., Los Angeles, are designers and manufacturers of valves and accessories for the aircraft industry. On 52 different die cast parts alone such as covers, bodies, and cranks, they drill 62 various size holes ranging from 3/32" to as small as No. 54 (.0550). Many are difficult angle holes that required exceptional care and skill by the operator who performed the job manually on a standard drill press.

This particular operation has always been a problem because of excessive drill breakage, scrap losses, and low production. Small hole drilling has always been the bottleneck of the drill press line.

Recently, the Whittaker Company installed a Dumore drill head and timer in conjunction with air cylinders and electric controls making an automatic recycling drill press.

The table has vertical movement controlled by an air cylinder mounted below. Automatic clamping of the piece and in some instances, automatic indexing are additional features of the set-up. Complete drilling operation is controlled by push button.

On one operation alone, based on 100 percent standard, the new production rate is now 1,197 pieces per day as against 315 pieces on hand operated drill press. Drill breakage dropped from 20 in 1,000 pieces to 1 in 1,000 parts, a saving of approximately 19 drills per 1,000 pieces. In addition, handling time was cut 83 percent and set-up allowances were lowered 50 percent.

Before the first run was completed, the cost of the Dumore automatic drill had been repaid. Furthermore, material waste was eliminated and operator fatigue disappeared. On manual small-hole drilling, approximately one operator in a dozen has the sensitive feel to perform the job productively. With this set-up any operator on the line can be trained in 15 minutes.

By setting the air pressure adjustment to suit material and drill size, holes as small as No. 80 (.0135) can be drilled with comparative ease. A simple built-in compressor controls feed and speed of the drill. This unit operates in any position and fits into most types of production set-ups for small hole

continued next page

Are you SURE you're using THE MOST EFFICIENT FINISH?

If your production involves finishing zinc, cadmium, aluminum or cuprous metals, you owe it to yourself... and your customers... to investigate

IRIDITE®

for on any of these metals Iridite gives you a high performance finish at a low cost from a simple chemical dip.

IF YOU WANT HIGH CORROSION RESISTANCE, you'll find an Iridite that will meet any military or civilian specifications for chromate finishing.

IF PAINT ADHERENCE IS IMPORTANT, you'll find Iridite prevents underfilm corrosion and soap formation.

OR, FOR BRIGHT, DECORATIVE FINISHES—

investigate zinc plate and Iridite (Bright) for a chrome-like decorative finish with more corrosion protection than conventional chrome plating . . . or Iridite (Metcote) as a treatment for copper that eliminates the need for buffing in the copper-chrome system; produces a sparkling bright finish!

Write for literature and send us samples for test processing. See "Plating Supplies" in your classified telephone directory or write direct.

Iridite is approved under government specifications.

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

Manufacturers of Iridite Finishes
Non-Corrosive Protective and Paint Bonding Coatings on Non-Ferrous Metals, ABD Process

For additional information Circle No. 41 on the Reader Service Card

continued from page 53

drilling in ferrous and non-ferrous metals, plastic, wood, etc.

The Whittaker Co. now have completed two automatic recycling drill presses which have relieved their drill press line of 90 percent of their small hole drilling.

COWLES SALES MEETING

TO GIVE the metal working industries more up-to-date service for better cleaning quality and economy, the Cowles Chemical Co. of Cleveland, Ohio, recently held a sales meeting at which special sessions were devoted to instruction and discussion of the latest and best materials and methods for metal cleaning. Company sales efforts and new product developments were also discussed at the meetings. The group participating in the meeting is shown.

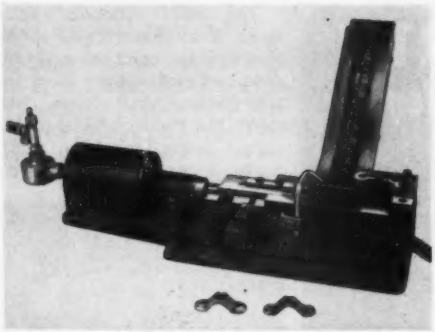
NEW CASTING PROCESS FOR ALUMINUM BARS

Apex Smelting Co. announces that its wholly owned subsidiary, Apex Metal Products Corporation of Cleveland, has acquired an exclusive license for the continuous casting of aluminum and all other non-ferrous metals under the Goss patents.

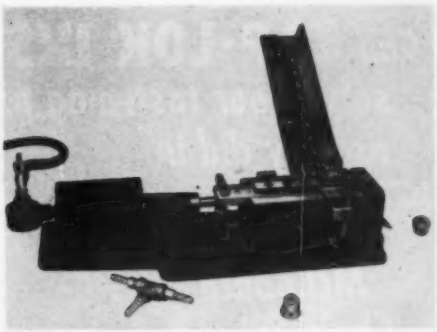
This process for the production of bar stock for screw machine and forging operations involves no intermediate forming.

E. B. METAL PRODUCTS MOVES TO NEW PLANT

E. B. Metal Products Co., Inc. and Omega Tool & Stamping Co., Inc. have announced their move to new, larger consolidated quarters at 12-12 Bridge Plaza South, Long Island City 1, N. Y. Factories and offices have been installed in the new location effective June 23.



TWO HOLES ARE DRILLED in brass castings fed to a two-spindle drill head by air-actuated No. 43 Mead work feeder. To allow for small miscalculations in the position of chute and bumper, slots are used for attachment instead of holes. The usual pawl, pivoted on the air cylinder ram, actuates a chip-blowing valve through a copper tube nozzle. Finished parts drop down the exit chute at the end of the base casting.



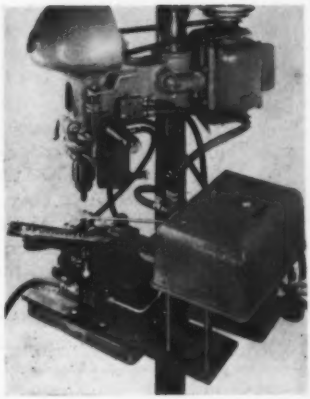
FOR TAPPING die cast knobs, this air-operated work feeder makes a rapid and efficient cycle. By adding a drill press feed and timer this would be semi-automatic machine with the operator merely loading the chute. The side-feeding chute is adjustable for slight variations in size of the work pieces, and stationary jaws can be interchanged to fit other shapes and sizes. All photos courtesy Mead Specialties Co.

AIR CONTROL saves labor in machining small castings

WITH LABOR COSTS SOARING, the use of air controls to eliminate manual operations in the feeding, machining and processing of small metal castings is gaining in popularity. Tool designers now consider every hand-motion as a possibility for adaptation to air-motion .

By changing from manual feed to automatic or semi-automatic setups with air cylinders, timers, hoppers and other auxiliary equipment: production rates can be greatly increased; one operator can frequently handle two or more machines simultaneously; improved uniformity can be achieved by dispensing with such human factors as fatigue-variations; and multiple operations can sometimes be ganged into a single setup.

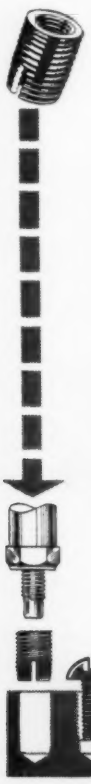
A few examples of the use of air controls for machining and processing die castings and other small, precision parts, are presented here from the files of Mead Specialties Co., Chicago.



AIR OPERATED rotary work feeder and two drill presses combined with two pneumatic drill press feeds and a Model 2 Meadmatic Timer, is shown here as installed at Harbot Die Casting Co., Nutley, N. J. Two Ettco double spindle drill heads are used. The disconnected air line to the left of the rotary work feeder is used to convey air to blow away chips and eject finished pieces. Part of this air jet is piped upward from below the work feeder table and blows the work pieces out against a baffle plate which casts them to the pile at the right.

Can TAP-LOK INSERTS* solve your fastening problem as they did in McCulloch Chain Saws?

View shows section of magnesium die cast crankcase in McCulloch Model 7-55 Chain Saw. Arrows point to Tap-Lok Inserts.



Tap-Lok Inserts have proven outstandingly effective in strengthening tapped threads in power tools such as McCulloch Chain Saws. Engineers and production men of McCulloch Motors Corporation, of Los Angeles, say of these Inserts:

"Fewer operations lessen assembly problems."

"Eliminate some difficulties encountered in machining magnesium die cast crankcases."

"Prevent stripping threads."

"Nuts are inaccessible from an assembly standpoint for this section of magnesium crankcase. Tap-Lok Inserts are more practical and economical."

Tap-Lok Inserts strengthen tapped threads in soft metals, plastics, wood, cast iron and other materials where the strength and durability of steel are required in the fastenings. They are easily installed with a special driving tool. As the insert is turned into a cored or drilled hole equal in size to a tap drill hole for the external thread of the Insert, the latter taps its own thread with the edges of its slotted segments. Tap-Lok Inserts are used as original equipment, for the salvage of rejects, and in maintenance.

Send for samples and descriptive folder

Also manufacturers of Groov-Pins for positive-locking press fit.

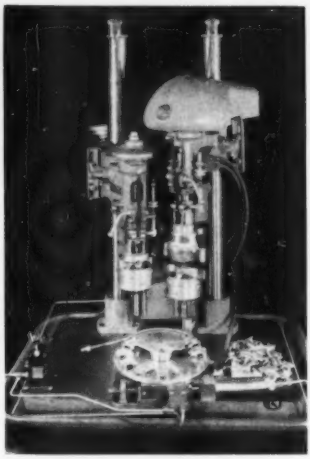
*REG. U. S. PAT. OFF.

GROOV-PIN CORPORATION

1122 Hendricks Causeway Ridgefield, New Jersey

For additional information Circle No. 43 on the Reader Service Card

The most common applications of air controls in connection with the machining of small, precision castings are those used for feeding drill press operations, but the ingenious tool designer today has been finding multiple other uses for air control, synchronization, ejection, and tool feed. It is, today, one of the commonest means at the disposal of the tool designer for simplifying, ganging and speeding production machining operations.



RECIPROCATING WORK FEEDER combined with a timer and drill press feed—both pneumatic—reams small metal parts automatically. The cycle release valve can be clearly seen, mounted on the side of the drill press feed. When the reamer reaches the bottom of its stroke, the arm on the drill press depth stop touches the button of its stroke, the arm on the drill press depth stop touches the button on the cycle release valve and shuts off the air to the drill press feed, which then returns to its starting point. At the same time, the fixture actuating valve releases the finished work piece and permits it to drop out of the chute at the end of the feeder base.

GET MANUFACTURING RIGHTS

The L. H. Butcher Co., of Los Angeles has recently been granted an exclusive license to manufacture and distribute the products of the Enthone Co. of New Haven, Conn. The Butcher Co. will service the Pacific Coast States and British Columbia. This company has been a distributor of Enthone products since 1943.

BELLOWS TO HANDLE LOCKE DRILLING UNIT

Exclusive sales and distribution rights for the Locke drilling and tapping unit have been acquired by The Bellows Co., of Akron, Ohio, according to an announcement by H. B. Link, president of The Bellows Co.

The Locke drilling and tapping unit is a compact, flexible drilling and tapping machine with a drill capacity from .013 to .250 in mild steel at an air pressure of 80 pounds. Rapid advance and retract are air powered, with feed rate hydraulically controlled. Feed is adjustable from 0 to three times the applied air pressure. (At a normal shop pressure of 80 psi thrust is adjustable from 0 to 240 lbs. However, the unit may be operated safely at air pressures as high as 200 psi.)

Spindle is electrically driven; spindle speed is adjustable through pulley drive from 0 to 8500 RPM. Maximum drill stroke is 3" of which any fractional part may be used at any place within the overall spindle travel. Depth accuracy with the standard mechanical trip is .005", but can be held to .001" with optional electric controls. Optional electrical controls likewise permit controlled dwell and automatic drill cleaning for deep hole drilling operations.

The Locke drilling and tapping unit measures 3¼" wide, 7⅝" high, 20⅛" long and weighs 40 lbs.

THERMO-CHEMICAL CORROSION PROTECTION

Stanwood Oil Corp. has acquired exclusive licensing rights to the Permyron process—a new process for the corrosion treatment of metals.

Discovered by Oscar B. Bach, industrial engineer, the Permyron process has been developed over a period of 13 years, and is now ready for industrial production. The process consists of thermo-chemical treatment of metals, which gives high corrosion resistance to mild steel and other ferrous metals.

From finishing hardware . . .

to sanding handles

Armour Backstand Belts do the job right

For the thousands of jobs where backstand belts can save you time, for the thousands of jobs other coated abrasives do so well, Armour has the answer – there's an Armour coated abrasive to do *your* job right.

Production Tripled!

The Coan Mfg. Co. of Madison, Wisconsin, decided to use backstand belts instead of set-up wheels in sanding bevels on steel guides for vending machines. The switch *increased production from ten to thirty guides per hour!* These amazing results proved to them that Armour backstand belts are more efficient, more economical than set-up wheels.

Belts are only one of the many forms of coated abrasives available to you from Armour. There are more than 30,000 different varieties in grit size, backing, etc. We have sheets, rolls, discs, tubes—and specialty sizes to meet your specifications.

Let your industrial supply distributor tell you about this complete Armour line. Ask for your free copy of the booklet, "Facts about Backstand Belt Grinding and Polishing"— or send the coupon.

We recommend buying through your industrial distributor

ARMOUR *Coated Abrasives*

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Please send me the free booklet, "Facts about Backstand Belt Grinding and Polishing."

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Cowles AM

A non-etching type aluminum cleaner for use in soak tank cleaning. It was specifically designed to remove drawing, stamping, spinning compounds, rolling oils, marking inks, crayon marks and shop dirt from common aluminum alloys prior to spot welding, anodizing or other finishing operations.

for better aluminum cleaning and deoxidizing

Cowles DO

A powdered acid type deoxidizer designed for efficient removal of the oxide film from aluminum prior to spot welding, anodizing or chromate finishing. It inhibits rapid reoxidation. DO solutions dissolve primary film rapidly, then reoxidize the metal surface slowly and uniformly with an air-stable oxide film without leaving smut residues.

Write for Technical Data Sheets on Cowles AM and DO Cleaners Prompt Shipments from Convenient Warehouse Stock

Cowles Technical Service Gladly Furnished Upon Request

COWLES CHEMICAL COMPANY
METAL CLEANER DEPARTMENT
7016 Euclid Avenue • Cleveland 3, Ohio

For additional information Circle No. 31 on the Reader Service Card

Close Manufacturing Control of Coated Abrasives with Nuclear Gages

THE manufacture of coated abrasives is controlled by a novel technique at the Coated Products Division of The Carborundum Company, Niagara Falls, N. Y. It is possible by nuclear gaging to automatically maintain the thickness of the adhesive and the density of the abrasive right on the production line, and to an accuracy within one per cent of specifications. Formerly, production control was on a cut-and-try basis, which required stopping machinery, cutting out an edge sample, checking the sample, then readjusting rolls and feeds.

In the new technique, developed by the Industrial Nucleonics Corporation, Columbus, Ohio, five radioisotope-actuated gages have been installed on each machine in the coated abrasive production line, where the thickness of the material can be measured as it is being processed. In each gage a sealed capsule of radioactive strontium emits beta rays. As the material moves past the aperture between the sources and the detector unit (a special type of ionization chamber), the amount of radiation passing through the material varies according to the density of the material. The beta rays that get through to the detector unit ionize a gas and thus create a voltage which provides a recording and controlling signal. Since the gage is calibrated, variations in beta ray transmission cause changes in the signal that vary directly with the change in weight per unit area.

With this gaging method, it is possible to produce on a practical manufacturing basis uniform coatings despite lot-to-lot variations in backing materials, and despite the slightest variation in flow of adhesive or abrasive onto the moving web, or variation in machine speed. In conventional manufacture, such errors tend to accumulate and might cause rejection of the finished product.

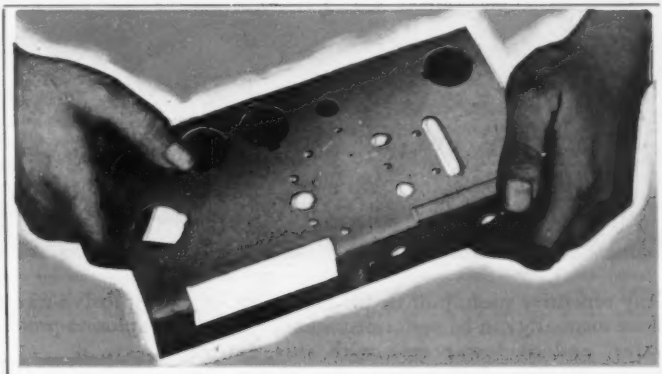
LEA FORMS SUBSIDIARY

The Lea Manufacturing Company of Waterbury, Conn., has announced the formation of a wholly owned subsidiary known as Lea Mfg. Co. of Michigan, Inc., formed for the purpose of manufacturing and marketing Gripmaster polishing wheel cement. Lea Mfg. of Michigan has purchased the patent rights, trademark rights and goodwill from the Nelson Chemicals Co. of Detroit, as of July 21, 1952.

For the time being, Lea will operate its manufacturing and distribution activities in connection with Gripmaster from the premises of Nelson Chemicals, 12345 Schaefer Highway, Detroit, but a new plant is also being constructed in Detroit and will eventually be occupied by both Lea and Gripmaster. Mailing address at present will be P. O. Box 3943, Strathmoor Station, Detroit 27, Mich.

JOIN GEORGE SALL CO.

David L. Longeuville and Charles A. H. Knapp have joined the staff of the George Sall Metals Co. as sales and service engineers. Both have had extensive experience in the foundry field. Mr. Longeuville was most recently superintendent of foundries for Eclipse Pioneer, and Mr. Knapp for many years owned and operated his own foundry.



COPPER-PLATED PARTS STAY BRIGHT AND CLEAN

When the plating shop treats them with WATER DIP #33

If you are doing your own copper plating or buying copper-plated parts . . .

Then you'll want the full story on a simple, low-cost metal treatment that *keeps* the copper surface bright and chemically clean—just as it comes from the plating bath. *Water Dip #33 prevents finger printing and staining during assembly, storage and use.*

IF YOU'RE DOING COPPER PLATING, you can cut out extra operations by using Water Dip #33. Work goes *directly* from the last hot water rinse into Water Dip #33—no need for rehandling and drying.

IF YOU'RE USING COPPER-PLATED PARTS, you will find that you can make excellent soldered connections, and you can make strong, uniform welds even after the parts have been dipped in Water Dip #33.

Water Dip #33 has many more advantages — in many types of plating. For the complete story, write for Technical Data Bulletin #117 or let our M & W technical consultant discuss your requirements privately with you.

PIONEERS IN PROTECTION

MAAS & WALDSTEIN CO. 439 RIVERSIDE AVE. NEWARK 4, N. J.

Midwest Div.: 1050 Carroll Ave., Chicago 12, Ill. • Pacific Coast Div.: Smith-Davis Co., 10751 Venice Blvd., Los Angeles 34, Cal.

MANUFACTURERS OF INDUSTRIAL FINISHES

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RUGGED, LOW COST AIR CYLINDER WITH BUILT-IN VALVE SETS NEW STANDARDS FOR FAST, PRECISION OPERATIONS

Built-in electrical operating controls, built-in 4-way valve, built-in dual piston rod speed regulators, all with a single air connection, simplify installation of economical pneumatic circuits.

Any repetitive push, pull or lift movement now done manually can be performed infinitely faster, safer, and at lower cost with this unique, electrically-controlled Bellows Air Motor. The range of work it can do is limited only by the imagination of the tool designer or production engineer.

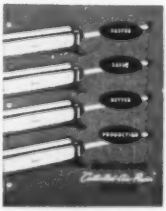
Unlike conventional air cylinders which require separate remote valves and cumbersome piping, The Bellows Air Motor is a complete power unit. It is compact, fits into crowded quarters, on moving machine elements. It is fast, responds to a starting impulse instantly. It is safe. Its low voltage operation simplifies wiring. It is sturdy, records of 10,000,000, 15,000,000, even 30,000,000 cycles without maintenance or repairs are commonplace.

The Bellows Air Motor is made in a wide range of mounting styles; in five bore sizes to meet varying power requirements; and in standard stroke lengths up to 48". For mechanical or manual operation the Air Motor can be equipped with a built-in manual valve, or for operation in explosive-hazardous areas with the built-in explosion-proof electrically controlled valve.

The Bellows Air Motor gives you an entirely new conception of the productive possibilities of air power. In the thousands of manufacturing plants where it is in use, it is establishing daily new records for cost reduction and improved productive efficiency. In metal working, in plastics, in woodworking, in any industry you can name, these versatile power units are sparking the imagination of cost conscious production men looking for ways to do old and new jobs better.

WRITE FOR THIS FREE 32-PAGE BOOKLET

HERE IN THESE QUICK-READING PAGES IS THE STORY OF "CONTROLLED-AIR-POWER" — WHAT IT IS DOING FOR OTHERS — WHAT IT CAN DO FOR YOU. THERE IS NO COST, NO OBLIGATION. ADDRESS: DEPT. PMM-552, THE BELLOWS CO., BELLOWS BLDG., AKRON 9, OHIO. ASK FOR BULLETIN CL-30.



The Bellows Co.
AKRON 9, OHIO

1464

BELLOWS "CONTROLLED-AIR-POWER" DEVICES FOR FASTER, SAFER, BETTER PRODUCTION

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PMM USEFUL LITERATURE

For additional information on the products appearing on this and the following pages, mark the key number of the item on the card bound into this issue. Drop the card in the mail—no postage is required.

PROCESSES

Investment Castings—What They Are, How They Are Made: No. 144
Step-by-step illustrations show how Precision Metalsmiths, Inc. produce investment castings, using more than 160 different ferrous and non-ferrous alloys. The new booklet entitled, "Pour Yourself an Assembly," shows many uses for investment castings.

Designing for Powder Metallurgy: No. 145
Reprints of a paper, "Some Considerations in Designing Parts for Powder Metallurgy" given before an ASME meeting by Irving J. Donahue, are available from Kwikset Locks, Inc., Powdered Metal Division.

Technical Report on Electroforming: No. 146
Available from The International Nickel Company are reprints of a paper, "Engineering Electroforming," by M. H. Orbaugh. The paper reviews the process and its applications.

Uses of Zinc in Telephone Dial Mechanism: No. 147
Feature story of the June issue of the Horse Head Bulletin from New Jersey Zinc Company reveals the uses for zinc in the new telephone dial mechanism. Included are zinc base die castings and brass powdered metal parts.

Guide to Use of Steel Investment Castings: No. 148
An article "The Plus and Minus of Steel Precision Investment Castings," by A. C. Williams of Crucible Steel Co. of America is available in reprint form. The article reviews the process from a designer's point of view, and suggests where to use and where not to use steel investment castings.

Vacuum Deposition of Thin Metal Films: No. 149
A 4-page data sheet from Distillation Products Industries gives basic information on a process for vacuum deposition of thin metal films, claiming greater brilliance than deposits applied by electroplating or painting. The process is used for decorative metal coatings.

Guide to Investment Castings: No. 150
A 12-page guide to investment casting newly published by Investment Casting Co. contains a picture story of the process and makes available criteria for appraising parts to determine whether they are suited for production by investment casting. Also explains how to eliminate machining, tooling and assembly costs.

MATERIALS & EQUIPMENT

Aluminum Alloy Compositions & Properties: No. 155
Apex Smelting Co. has published a new 24-page aluminum alloy folder covering the composition, typical mechanical properties, heat treatments and basic foundry applications of the standard aluminum alloys produced by the company.

Apparatus for Checking Metal Powder Characteristics: No. 156
A data sheet from Metals Disintegrating Co. Inc., presents laboratory instruments for determining the flow rate and apparent density of metal powders within standards set up by the Metal Powder Association. Also included is a transverse tester for determining green strength of metal powder compacts.

Sintering Furnaces & Atmosphere Generators: No. 157
A folder from Westinghouse Electric Corp., Industrial Heating Dept., presents the 3 furnace types which the company manufactures for sintering powdered metal, and also 3 basic types of atmosphere generators.

Aluminum Pellets for Making Zinc Die Casting Alloy: No. 158
Uniform pellets of aluminum to serve as additives in making zinc base die casting alloy are presented in literature from The George Sall Metals Co. Complete data concerning these magnesium-free, low melting point aluminum additions are included.

Non-Ferrous Melting Kettles of Nickel Iron for Longer Life: No. 159
An article in the current issue of Nickel Topics published by The International Nickel Company gives interesting information concerning melting kettles for non-ferrous alloys manufactured by C. H. Milles Foundry Co. The kettles are of cast iron containing nickel. Unusually long service life is reported.

Standard Mold Bases & Moldmakers' Supplies: No. 160
A 144-page comprehensive catalog has been published by Detroit Mold Engineering Company showing their complete line of standard mold bases and moldmakers' supplies. The company specializes in standard mold supplies for the die casting and plastic molding fields.

Preventing Galling of Die Casting with Solid-Film Lubrication No. 161
Application and results of applying Electrofilm solid-film lubrication to metal surfaces are covered in a brochure from Electrofilm Corp. Among the interesting applications included is the prevention of galling & scoring of aluminum die castings used in rotary valves.

Direct-Fired Heat Treat Furnaces: No. 162
A new bulletin on direct-fired furnaces for all types of heat treat processing has been released by Surface Combustion Corp.

Catalog of Tablet Presses for Powder Metallurgy: No. 163
Available is a new catalog from F. J. Stokes Machine Co. covering a complete line of tabletting presses for powder metal, pharmaceutical, plastic preform and other uses. All models of single-punch, rotary, mechanical and hydraulic presses are included.

Beryllium Copper Cavities for Die Casting Zinc: No. 164
An elaborate technical data book from Manco Products offers complete information concerning the use of beryllium copper for die cavities. Cavities are produced by means of a tool steel hob in molten beryllium copper under heat and pressure. Metallurgical, performance and mechanical considerations are discussed and illustrated.

Induction Melting Furnaces: No. 180
With capacities ranging from 500 to 2200 lbs., the new induction melting furnaces just announced by the Lindberg Engineering Co. are designed specifically for the precision casting industries. Bulletin No. 560 describes the furnaces and gives their capacities, dimensions, and rated power requirements.

FINISHING

Electrostatic Paint Spray Method: No. 165
A new, low cost electrostatic paint spray process has been introduced by Staticote Systems Inc. The new method and equipment for applying paint are thoroughly covered in illustrative literature from the company.

Use of Soluble Oils: No. 166
A small booklet from Aldridge Industrial Oils, Inc., tells how to cut costs with Aldridge soluble oils and other cutting and grinding fluids. Cutting chart for steels, aluminum, bronze and copper is included.

continued on page 85

Circle No. 86 on the Reader Service Card

FREE!

61 PAGES OF FACTS FIGURES PHOTOS ON

BARREL FINISHING

Get the complete story! Learn about latest developments in equipment, compounds, abrasives. Amazing results now possible on almost all types of parts from large castings to small intricate parts.

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ALMCO Supersheen

AMERICA'S LARGEST MFGR. OF ADVANCED BARREL FINISHING EQUIPMENT, MATERIALS & COMPOUNDS

ALBERT LEA, MINNESOTA

CARBOLOY NAMES THREE

Three appointments have been announced by F. J. Staroba, manager-field sales, Carboloy Department of General Electric Company, Detroit, Mich. E. R. Almdale is to be manager of Carboloy's Atlantic District, V. H. Dearle is to be manager of the Michigan District, and Robert Grorud as Alnico specialist. Carboloy Division is a manufacturer of specialized metals and cemented carbide tools for the metalworking industry.

DEVELOP NEW ALLOYS

Research aimed at development of a series of casting alloys in the intermediate temperature range of 900 to 1400 F has been undertaken by Battelle Memorial Institute, it has been announced by the Alloy Casting Institute.

Objectives stated are to 1) increase the number of industrial processes in this temperature range, and 2) replace some of the higher-alloyed grades to save scarce nickel and chromium.

For additional information Circle No. 85 on the Reader Service Card

ENAMEL FILL

Your Die-Cast Parts

In Color With Lettering and Design

5 TIMES FASTER Than Hand Filling

The Acroprinter illustrated shows only one type of machine we build for color filling of lettering and design with enamel. Send samples of parts you wish to fill for estimates.

The ACROMARK Company

426 Morrell St., Elizabeth 4, N. J.

"The Original Marking Specialists"

18 WAYS TO SAVE TIME & MONEY!

with the

Mead Industrial Burring Machine

WOOD-PLASTIC-METAL

New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money—also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All Trades" machine. Your burring can be done in "free time"—install these machines by every machine tool which leaves burrs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for the informative Money-Saving circular now.

MEAD SPECIALTIES COMPANY

4114 No. Knox Ave. Dept. DC-82, Chicago 41, Ill.

For additional information Circle No. 80 on the Reader Service Card

HOW DO YOU CLEAN BIG METAL PARTS?
HOW DO YOU STRIP PAINT SO QUICKLY?
HOW DO YOU KEEP YOUR EQUIPMENT SO CLEAN?
MY OAKITE STEAM GUN DOES ALL THE HARD JOBS

This man knows the best way to clean metal parts that a e too large for tanks or washing machines . . . He knows the best way to strip paint from large surfaces.

His Oakite Steam Gun will clean large equipment like die casting machines, wire drawing machines, blooming mill rollers, brass reduction machines, millers and grinders, drill presses, stamping machines, etc... It will do practically every cleaning job that's too big or too difficult for ordinary methods.

FREE For your copy of "*Time saved with Oakite steam-detergent cleaning*" write to Oakite Products, Inc., 34G Rector St., New York 6, N. Y.

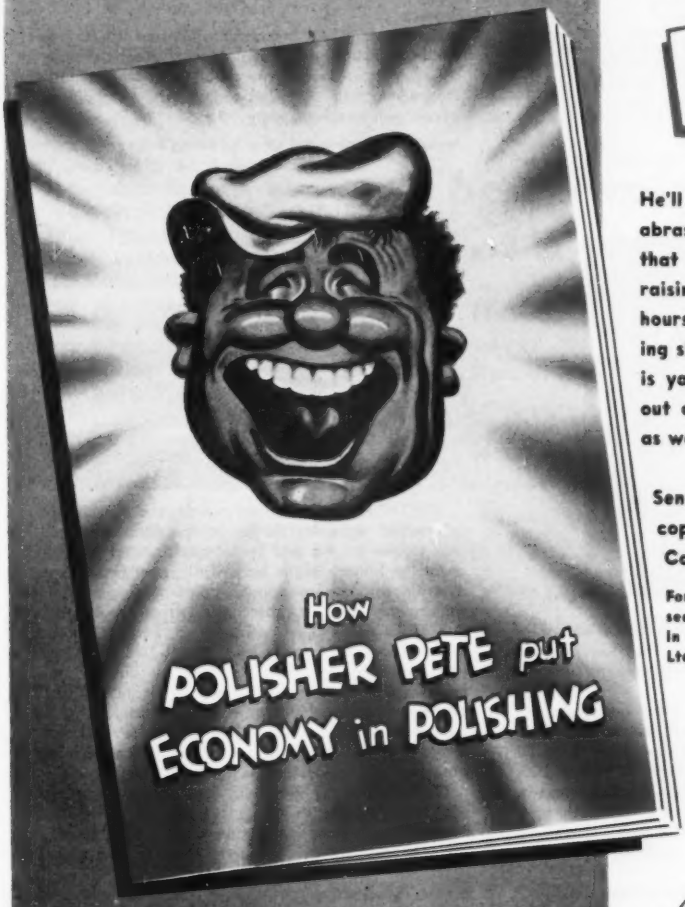
Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE

SPECIALIZED INDUSTRIAL CLEANING MATERIALS • METHODS • SERVICE

For additional information Circle No. 81 on the Reader Service Card

MEET POLISHER PETE!



He'll give you the latest on modern abrasive belt polishing techniques that are producing finer finishes, raising output and slashing man hours and production costs in plating shops everywhere. If polishing is your business, you'll get a kick out of reading "Polisher Pete" — as well as a wealth of information.

Send the coupon for your free copy today to Behr-Manning Corporation, Troy, N. Y.

For export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A. In Canada: Behr-Manning (Canada) Ltd., Brantford, Ont.

BEHR-MANNING CORPORATION
division of NORTON Company

▲COATED ABRASIVES ▲SHARPENING STONES ▲PRESSURE-SENSITIVE TAPES

Behr-Manning Corp., Troy, N. Y., Dept. PR-8.
Please send me your new booklet, "How Polisher Pete Put Economy in Polishing."

Name_____

Street_____

City_____ Zone___ State_____

For additional information Circle No. 39 on the Reader Service Card

PMM NEW PRODUCTS

For additional information on the products appearing on this and the following pages, mark the key number of the item on the card bound into this issue. Drop the card in the mail—no postage is required.

FILTERS FOR WATER HYDRAULIC SYSTEMS

Marvel Synclinal Filter
Marvel Engineering Co.

SPECIAL FEATURES: Balanced synclinal design of Marvel's filters for hydraulic and other low pressure oil circulating systems has been adapted for filtering water.

SPECIFICATIONS: All models have been adapted for water use. Sump type available in capacities from 5 to 100 G.P.M. and line type from 5 to 50 G.P.M. Monel mesh sizes from coarse 30 to fine 200. No changes in basic design; line types still operate in any position and may be serviced without disturbing pipe connections. Both sump and line type models may be dissassembled, cleaned and reassembled on the spot by any workman.

Balanced synclinal design provides maximum filtering area with a large capacity for accumulating filtered out matter, thus allowing longer periods of operation between cleanings.

For additional information circle No. 196 on Reader Service Card

WATER SOLUBLE HONING COOLANT

Pelron No. 560
Pelron Corp.

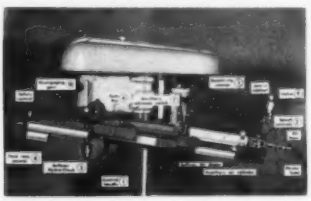
SPECIAL FEATURES: Allows cool honing by dissipating heat, while also having the cleansing and anti-rust qualities associated with kerosene.

SPECIFICATIONS: Contains high percentage of liquid detergent, an extreme pressure agent, a rust preventative. Used in concentrations of 15-20:1 depending on individual requirements. Heat developed by other types coolant are reported to be eliminated, thus eliminating out-of-roundness, taper, loading of stones with graphite paste, etc.

For additional information circle No. 197 on Reader Service Card

SENSITIVE DEEP-HOLE DRILL FEED REDUCES DRILL BREAKAGE

Sensitorque Drill Press Feed
Bellows Co.



SPECIAL FEATURES: Does not depend on any predetermined timing cycles for its operation but measures torque on the drill and "senses" what is going on at the bottom of the hole. Drill is withdrawn only if strain approaches danger point. Avoids needless withdrawals and yet protects drill from breakage.

SPECIFICATIONS: Consists of a Sensor Cabinet mounted on standard Bellows Model DFE drill press feed. Sensing unit does its work by aircraft type relays without electronic tubes and circuits. If drill becomes clogged with chips, runs dry of coolant, hits a blow hole or seizes in any way, drill press feed withdraws drill and then immediately returns it to working position.

On its return, the drill point does not hit the bottom of the hole with sharp impact, but is eased into position by Bellows Hydro-Check unit. By means of rheostat, the unit can be set to react to drill torque of a few inch-pounds up to the full spindle motor power, Sensitorque develops a thrust ranging between 5 and 7½ times the applied air pressure, depending upon the immediate gearing of the drill press on which it is installed.

For additional information circle No. 198 on Reader Service Card

ELECTRIC IMMERSION HEATER

Glorod
Cleveland Process Co.

SPECIAL FEATURES: Being made of fused quartz, it is totally inert to acids, requires no cleaning or maintenance and eliminates "stray" currents in electroplating work. Useful for electroplating, electropolishing and phosphatizing.

For additional information circle No. 199 on Reader Service Card

YALE & TOWNE BUY METAL POWDER FABRICATING PLANT

The Yale & Towne Manufacturing Company has entered into a contract to purchase the American Sintered Alloys, Inc. of Bethel, Conn., in exchange for Yale & Towne stock, it has been announced by Gilbert W. Chapman, Yale & Towne president.

American Sintered Alloys, Inc. manufacturers sintered powdered metal parts which are used principally as components in the end products of other manufacturers, including Yale & Towne.

Yale & Towne plans to operate ASA as another of its manufacturing divisions and to continue the sale of sintered metal components to other manufacturers through Eugene P. Pack & Associates, with sales offices at West Hartford, Conn., East Orange, N. J., Philadelphia, Rochester, Detroit, Cleveland, Chicago, Pasadena and San Francisco.

In acquiring this sintered metal product business, Yale & Towne will enter a third field of manufacture. Yale & Towne has been manufacturing locks and other hardware since 1868, and materials handling industrial equipment since 1875.

Yale & Towne's domestic plants which produce materials handling equipment are located at Philadelphia and Chicago; its domestic plants for locks and hardware products are at Stamford, Conn., Salem, Va., Berrien Springs, Mich., and a new plant is scheduled to be completed by the end of the year at Gallatin, Tenn. Yale & Towne's plants in Britian, Canada and Germany manufacture both hardware products and materials handling equipment.

JOINS U. S. REDUCTION

E. A. Bergman, president of the U. S. Reduction Company, with plants at East Chicago, Indiana and Toledo, Ohio, has announced the addition of Wilfred H. Stewart to his staff as chief process engineer.

The meaning of a signature!

Through a quarter of a century of knowing how, the Super Cast reputation for Better Methods—Better Die Castings, has been recognized.

Sound engineering, metallurgical knowledge and skilled techniques have achieved and maintained a standard of superior quality.

Super Cast has kept faith, always deserving the mark it bears. Super Cast means die castings for those who want the best.

A sound, time-tested institution and a sound time-tested product have won confidence and widespread endorsement.

THE SUPERIOR DIE CASTING COMPANY

1001 London Road CLEVELAND 10, OHIO

For additional information Circle No. 40 on the Reader Service Card

For additional information Circle No. 63 on the Reader Service Card

Seein' is Believin'

FORT PRECISION IS Worth looking into

Seeing is Believing and although they are rarely seen by any but mechanics, oil pump housings are a very important part of the engine of your car. "FORT" precision castings are used for this important job because they are perfectly engineered, thus are durable, light in weight and require a minimum of machining.

TRADE FORT MARK

Three types of oil pump housings made by "FORT"

FORT DIE CASTING CORP.

MARYSVILLE, MICHIGAN

NEW BOOKS

Metallurgy for Engineers by Wulff, Taylor and Shaler appears to be one of the more comprehensive books on the market that gives adequate coverage of a highly technical subject in terms that not only engineers but production and operation men can understand.

Except for a relatively small portion of the book which deals with the more technical aspects of metallurgy, all of the material is offered in highly usable and understandable form.

Individual chapters cover, among other things, Determination of Mechanical Properties of Metals, Heat Treatment of Steel, Corrosion, Sand Casting, Die Casting, Heat Flow, Gating, Casting Defect, etc.

The book appears to be a valuable addition to the metallurgical literature. (John Wiley & Sons, Inc., New York, N. Y. $6.50)

TOUGH PRODUCTION PROBLEMS

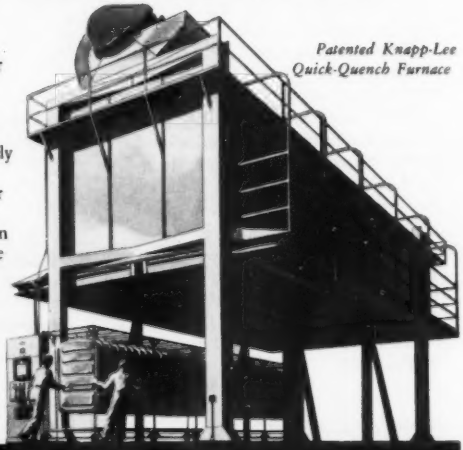
MADE EASIER WITH KNAPP'S 30 YEARS KNOW-HOW!

Manufacturers who have tough production schedules equip their plants with Knapp heat-treating equipment.

They are using them because they are built for SPEED:—Temperature recovery well within established limits. Quench adjustable from 3 to 8 seconds with arrested descent immediately before immersion, thus reducing impact and preventing excessive distortion; EASE OF HANDLING:—assured by floor level loading and unloading; SAFETY:—positive locking devices at floor level and top positions, all operations push button controlled by one operator; ACCURACY:—guaranteed variance of temperature not to exceed plus or minus 5°F in any part of the working zone after stabilization; QUALITY:—uniformly high physical and chemical properties due to the elimination of the human element.

Over 40 Airframe and other Manufacturers in the U.S. and abroad are meeting their production schedules with patented Knapp-Lee Quick-Quench furnaces.

Patented Knapp-Lee Quick-Quench Furnace



The Knapp reputation for building better equipment is maintained throughout its entire line of standard and custom built furnaces. Knapp has the answer to your heat treating problems. Write today.

JAMES H. KNAPP COMPANY

INCORPORATED

INDUSTRIAL FURNACES THAT SATISFY

839-841 EAST FOURTH STREET • LOS ANGELES 13, CALIFORNIA

For additional information Circle No. 59 on the Reader Service Card

REFERENCE MATERIAL, catalogs and data offered free in this month's ads (circle numbers on reader service card.)

2. HANDBOOK ON ALUMINUM castings describes alloys and production facilities of Aluminum Industries, Inc.

4. CERTIFIED ZINC, a description of the Certified Zinc Alloy Plan can be secured from the American Die Casting Institute.

7. STEEL CASTINGS made by the investment casting process are described and illustrated in literature from Crucible Steel Co.

8. SMALL DIE CASTINGS produced by Dollin Corp. Small Castings Department, are the subject of a booklet.

9. SMALL DIE CASTING MACHINES are described in a new catalog available from DCMT Sales Corp.

11. COST REDUCTION by die casting is described in a booklet offered by the Hoover Co.

12 HIGH SPEED DIE CASTING machines are the subject of literature and spec sheets from Hydraulic Press Mfg. Co.

13. NEW ALUMINUM ALLOY specifications are listed in a brochure from Wm. Jobbins. Alloy is Almag 35.

15. TWO CHAMBER INDUCTION melting furnaces for non-ferrous alloys are described in literature from Lindberg Engineering.

17. DIE CASTING MACHINES built by Lester-Phoenix are described in a catalog.

19. FACTS ON PERMANENT MOLD and die cast parts are offered in in a Fact File from Monarch Aluminum.

20. NON-FLAMMABLE HYDRAULIC fluid is described in literature available from Monsanto Chemical Co.

24. DIE CASTING FACILITIES of Pressure Castings, Inc. are offered in a descriptive folder.

25. PROTECTION FOR HYDRAULIC fluids from overheating by the use of heat exchangers is the subject of a guidebook from Kewanee-Ross Corp.

29. ECONOMY IN POLISHING is the subject of a new booklet available from the Behr-Manning Corp.

30. CONTROLLED AIR POWER is the subject of a 32-page book available from the Bellows Co.

31. CLEANERS FOR METAL are the subject of several technical data sheets from Cowles Chemical Co.

33. LUBRICANTS FOR DIE CASTING are described in a booklet issued by E. F. Houghton Co. Silvery color is a special feature.

35. POWDERED METAL PARTS, their production and uses are described in a bulletin from Michigan Powdered Metal Products Co.

36. DIMENSIONING DIE CASTINGS is the subject of a guide book from Newton-New Haven Co.

38. GEARS FROM METAL POWDER are described in a booklet just issued by Powdered Metal Products Co.

41. IRIDITE FOR PROTECTING metal surfaces is described in literature from Allied Research Products.

42. BACKSTAND BELT GRINDING and polishing is the subject of a booklet from Armour & Co. Co.

43. SCREW THREAD INSERTS for use in die cast metals are the subject of a data sheet from Groov-Pin.

45. ZINC STEARATE, its properties and uses as a powder metallurgy lubricant are described in a bulletin from American Cyanamid Co.

48. SPECS FOR CAST-MASTER die casting machines are presented by Cast-Master, Inc.

49. ZINC ALLOY SUPPLIERS, Henning Bros. & Smith, offer a monthly house organ called The Henning Messenger.

51. HOW TO DESIGN aluminum & magnesium die castings is the subject of a data book from Litemetal Dicast.

continued next page

Use the die casting lubricant that gives you EVERY advantage

✓	Silvery in color—makes castings bright
✓	Castings ready to use, if no special finish is required
✓	Safely withstands high pressure moulding
✓	Lubricates efficiently under intense heat
✓	Protects expensive moulds and keeps them clean
✓	No sticking, scoring or soldering—castings are easily removed
✓	Castings are more accurate, less porous

HOUGHTON

Mouldlubric

THIS SPECIAL DIE CASTING LUBRICANT is silvery in color—not black like ordinary types. Mouldlubric was developed by Houghton's research staff to safely withstand today's high pressure moulding. Get complete information by writing to E. F. Houghton & Co., Philadelphia 33, Pa., or ask the Houghton Man when he calls.

MOULDLUBRIC
...a product of

E. F. HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

For additional information Circle No. 33 on the Reader Service Card

53. PREVENTING METAL DRIP between faces of die casting dies with a new "No Drip" device is explained in literature from Ring Valve.

56. KEEPING COPPER-PLATE BRIGHT and clean by the use of Water Dip No. 3 bath is the subject of a bulletin from Maas & Waldstein.

57. DIE CASTING FOR DEFENSE is the subject of a booklet, "We're Geared for Your Defense Needs" from Advance Tool & Die Casting.

58. SMALL DIE CASTING machines are reviewed in a catalog from A. B. C. Die Casting Machine Co.

61. GREY IRON CASTINGS produced by the permanent mold process are described in a circular from Dostal Foundry Co.

66. DESIGNING FOR POWDER metallurgy is the subject of a handbook from International Powder Metallurgy.

73. THE RIGHT WAY is the title of a booklet describing the applications and advantages of investment castings, available from Hitchiner Mfg. Co.

74. TILTING TYPE MELTING furnaces made by Detroit Electric Furnace Co. are described and illustrated in a catalog.

76. REFERENCE FOLDER on a line of P-V investments for the investment casting process is offered by Pre-Vest.

80. MACHINE FOR DEBURRING is the theme of an informative circular from Mead Specialties.

81. STEAM-DETERGENT cleaning is described in a booklet available from the Oakite Co.

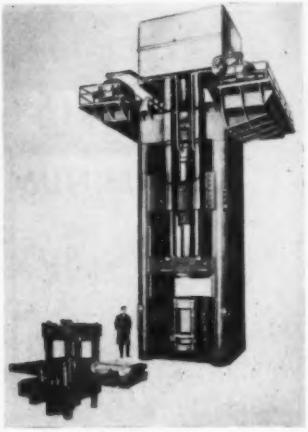
86. BARREL FINISHING methods, materials and equipment are covered in 3 reference books available from Almco Div. Queen Stove Works.

87. TOOLS FOR DIE WORK are described in the new "All Star" catalog just issued by Severance Tool Industries, Inc.

HYDRAULIC PRESS MARKS 75 YRS.

BETWEEN the small cider press on the left and the towering deep-draw blankholder on the right, **below,** have elapsed 75 years of industrial progress. The story of progress of hydaulic presses virtually parallels the story of progress of American industry.

Celebrating their 75th anniversary this summer is the Hydraulic Press Manufacturing Company of Mt. Gilead, Ohio, whose first press was the small cider press. Founded in 1877 by Augustus Q. Tucker, a mechanical engineer and, not incidentally, owner of an extensive apple orchard. It was logical that the first press he developed was a cider press.

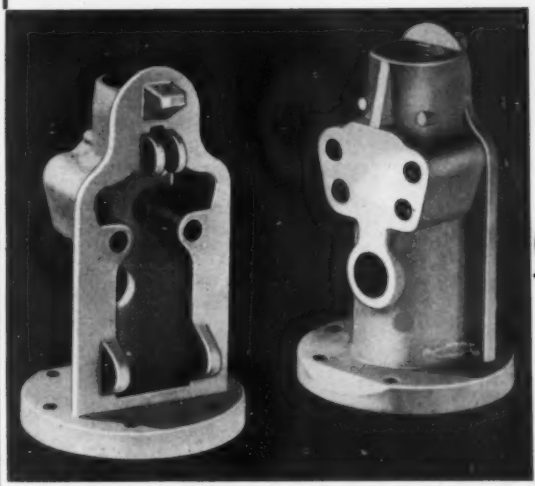


From cider press . . .
to metal forming.

The wide acceptance and popularity of early hydraulic presses was phenomenal, and from the fruit juice industry, the application of hydraulics for presses became widespread.

Since introduction of the first hydraulic press, the company has been credited with many other developments and contributions to this field. One of the most important is the develop-

"Cleveland"
GOVERNOR BASE for COMPRESSOR



A REAL JOB TO DO . . . .

Yes indeed, a Governor Base is an important supplement that must do an important job and that MUST function properly and accurately. Like every Cleveland Casting utmost care is practiced in producing the ultimate in quality.

This is true not only of a "Cleveland" Governor Base, but of EVERY "Cleveland" Casting. We encourage inquiries relative to your particular problems. Reply will be prompt.

Every "Cleveland" Job Is Important

The Cleveland Hardware & Forging Co.
Est. 1881
3256 E. 79th ST. • CLEVELAND 4, OHIO

For additional information Circle No. 47 on the Reader Service Card

For additional information Circle No. 57 on the Reader Service Card

This Booklet Explains
Why We Merit Consideration
For Your Defense
DIE CASTINGS

we're geared for your defense needs

ADVANCE TOOL & DIE CASTING COMPANY

Please send for a copy today!

ADVANCE TOOL and DIE CASTING CO.
3764 NORTH HOLTON STREET
MILWAUKEE 12, WISCONSIN

ment of the first self-contained, all-hydraulic, closed circuit Fastaverse system of operation for hydraulic presses.

H-P-M presses have since been introduced for a wide range of metal working operations, including die casting, powder metallurgy, deep drawing, extruding, forging, embossing, sizing, die straightening, etc. In the process fields, salt, carbon, ceramics, rayon, cellophane, wood, asphalt and plastics are other materials with which H-P-M hydraulic presses have a close working relationship.

APEX PLANT IN L. A.

The Apex Smelting Co. of Chicago has acquired a 20 acre site within the industrial Los Angeles area where a new plant will be built to produce aluminum, magnesium and zinc base alloys.

This expansion is in line with the company's policy of having manufacturing facilities at stra-

Here's Outstanding
Cost Cutting on Metal Parts

A leading tool manufacturer, is now using the illustrated copper iron wear resistant plunger for grease fittings on 3" valves to prevent back flow of grease at 20,000 lbs. pressure. Here are facts and figures that show how International Powder Metallurgy metal parts are increasing production and lowering costs.

- Eliminated tooling investment of approximately $15,000 – International Powder Metallurgy Co. tooled up for $400.00.
- Tooled up and in production in four weeks.
- High rate of production – 5000 parts per day.
- Cut costs 5½c to 3c per part.

The Powder Metallurgy Engineers' Handbook is available to you. Send for a copy on your company's letterhead.

IPM
International Powder Metallurgy Co.
439 W. MAIN STREET • RIDGWAY, PENNSYLVANIA

For additional information Circle No. 68 on the Reader Service Card

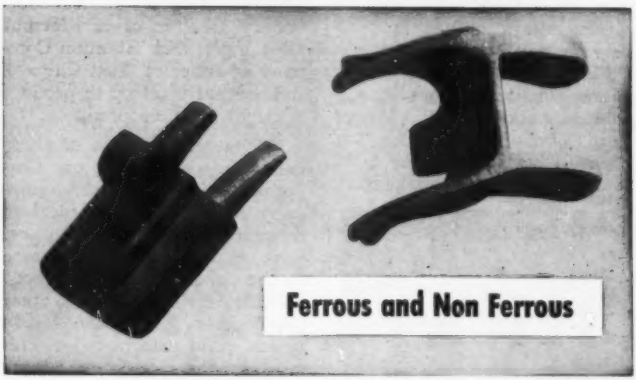
DIE CASTINGS
ALUMINUM OR ZINC
☆
C. M. GREY MFG. CO.
QUALITY PRODUCTS SINCE 1910
SEND BLUEPRINTS OR SAMPLES FOR QUOTATIONS
358 CENTRAL AVENUE
EAST ORANGE, N. J.

Circle No. 82 on the Reader Service Card

For additional information Circle No. 60 on the Reader Service Card

Precision Castings

"LOST WAX" PROCESS



For those difficult small parts where dimensions are close and shapes complex, our "lost wax" castings in a variety of alloys may solve your problem. Consult with us and use our experience to your advantage.

CADMET CORPORATION

15315 TULLER AVE. • PH: UNIVERSITY 2-5714 • DETROIT, MICH.

tegically located points with respect to both raw materials and customers. The new plant will have complete facilities for melting, and laboratory control.

AJAX ELECTRIC NAMES REPS.

The Samson Sales Co. of San Francisco, has been appointed to handle Nevada and the Northern half of California for the Ajax Electric Co,. of Philadelphia, Pa., makers of Ajax electric salt bath furnaces for the heat treating of metals.

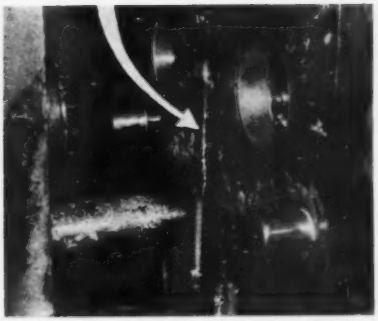
Other recent sales representative changes announced by Ajax include the appointment of Richards-Conant, of Denver, Colo., to cover Wyoming, Colorado, Utah, Arizona, and New Mexico, while W. E. Hartley of Seattle, will handle the line in the Northwestern states of Washington, Oregon, Montana, and Idaho.

In the Northeast, the territory of long-time Ajax representative Joseph M. Hallorn, has been extended to include all of New England.

FOR ZINC DIE CASTING MACHINES

Stop DRIP *on front die with*

Ring "*No-Drip*" ● Control



This control prevents die damage and costly die repairs caused by metal drip on front die as die opens, regardless of cycle time.

Easily installed, positive in action, trouble-free, it pays its way FAST. Only one moving part.

Ring *"NO DRIP"* Control is quickly adjusted to different time cycles. It permits free flow on shot stroke, retards speed of plunger on return stroke. This creates a vacuum which withdraws metal from nozzle on upward movement after die separation, preventing "run-out". Leaves a clean sprue with no drip or needle point. No need to run with cold nozzle . . . you get better results!

RING VALVE CO., Inc.
CLAWSON • MICH.
Telephone LIncoln 2-3387

RING VALVE CO., Clawson, Mich.

Gentlemen:

Please send latest data on your Ring "NO DRIP" Control for Die Casting Machines.

Name .....

Title .....

Company .....

Street .....

City ..... **Zone**..... **State**.....

For additional information Circle No. 53 on the Reader Service Card

CHRISTIANSEN INTRODUCES NEW TYPE FINANCING SYSTEM

A new method of industrial financing which provides the investor with protection of purchasing power and avails the industrial employee of a low-risk investment to serve as a hedge against inflation has been announced by Edward S. Christiansen, president of Christiansen Corporation, Chicago, producer of aluminum and magnesium alloy ingot, zinc base die casting alloys, and other products for the foundry.

Christiansen Corp. also is the parent company of four wholly-owned subsidiaries: Magnesium Company of America, East Chicago, Indiana, leading fabricator of wrought magnesium products; Alumicast Corporation, Chicago, manufacturer of aluminum and magnesium permanent mold and die castings; Industrial Smelting Corporation, Chicago Heights, Illinois, secondary smelter of non-ferrous alloy ingot; and Titanium Company of America, East Chicago, Ind., recently set up to produce wrought titanium products.

"Upon the issuance of these debentures, Christiansen Corporation becomes the first company in the history of American financing to issue debentures with 'escalator' provisions based on the Consumers' Price Index," said Mr. Christiansen. "No other bonds ever have been issued which could gain in value with rises in the Consumers' Price Index."

E. S. Christiansen

The "Christiansen Plan—Inflation Provision Debenture," as it has been named, is 4½ per cent, 20 year debenture maturing July 1, 1972, he stated. The debentures are being issued in multiples of $100 in an amount totaling $300,000.

GRIES REPRODUCER APPOINTS CALIFORNIA REPS

V. T. Rupp Company, 2230 West Eleventh St., Los Angeles 6, California, has been appointed Southern California representatives of Gries Reproducer Corp. of New York, it has been announced by Joseph Saks, sales manager of the Products Dept. Verne Rupp and his associated will handle the complete Gries line of tiny zinc alloy die castings, plastic moldings and standard components.

UNIVERSAL
Die Castings

Preferred WHEN ONLY THE BEST IS GOOD ENOUGH

There must be a reason why so many highly discriminating manufacturers entrust *all* of their work to us. The reason is they *know* from experience that the finished job will meet every specification as to appearance, strength, accuracy and function. Furthermore, the price on either long or short runs is in line with their production and selling costs.

If you are located west of the Mississippi River we are in an excellent position to take care of your die casting requirements. Quotations made promptly.

UNIVERSAL
DIE CASTING COMPANY

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For additional information Circle No. 55 on the Reader Service Card

HITCHINER ORGANIZES JOB SHOPS TO MACHINE INVESTMENT CASTINGS

A program to reduce the cost of finishing investment castings and supplying them complete to print is announced by The Hitchiner Products Corp. of West Hartford, Conn. This company was activated primarily to finish the castings of the Hitchiner Manufacturing Co., Inc., of Milford, N. H., and has organized a selected group of job shops to perform the secondary operations on Hitchiner castings.

This service, according to A. Fred Hitchiner, company president, will eliminate the excessive costs of sub-contracting and handling by making one company responsible for supplying the finished castings. It will mean but one purchase order being placed, one point to contact for expediting and one inspection of the finished castings.

Common to most casting buyers is the problem of finishing castings. While the investment casting process, itself, produces intricate parts to reasonably close tolerances, it cannot meet all of today's exacting requirements and additional machining is often necessary. Because these finishing operations are so varied, few foundries are equipped with the necessary machinery for all of the secondary operations. Therefore, the customer must locate sources to handle this finishing work.

According to Mr. Hitchiner, job machine shops are usually limited in their capacity and their production is often very spotty, making it difficult to count on them to handle a job promptly. In many cases, because of the small quantities required, shops are not willing to accept this work. This involves a constant seeking by many buyers for new sources to handle their secondary operations. In arranging for the finishing of the castings, the buyer has many exceptionally high overhead costs which the service of this new company hopes to eliminate. These include the time spent in locating and qualifying of job shops to handle sub-contract work, the receiving and inspecting of rough castings between operations, the additional expediting and the large amount of paperwork accompanying these operations.

The engineering and direct supervision of the program will be under Philip J. McGoohan, vice president, with many years manufacturing and managerial experience including five years as a procurement officer and lieutenant colonel in Ordnance.

Large or Small . . .
SIMPLE OR COMPLEX
● Accurate can supply you with precision die castings when, how and where you need them. May we help you with yours?
Write today for complete service
Aluminum, Zinc, Magnesium Alloy Die Castings
ACCURATE DIE CASTING CO.
3089 E. 80TH STREET
CLEVELAND 4, OHIO

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For additional information Circle No. 62 on the Reader Service Card

DIE CASTINGS by FEDERAL

- COMPLEXITY
- ECONOMY
- PRECISION
- STRENGTH

FEDERAL-Built dies and high pressure casting equipment with water hydraulic impact injection assure **GREATER DENSITY and BETTER FINISH.**

8 inch mechanism cam of intricate design.

Advanced technique, modern equipment and mechanical skill enable FEDERAL to offer a complete precision die casting service in *Aluminum and Zinc Alloys.*

LICENSED PRODUCER

FEDERAL DIE CASTING CO.

2220 NORTH ELSTON AVE. • CHICAGO 14, ILL.

Phone ARmitage 6-4803

CARBORUNDUM FORMS METALS SUBSIDIARY

The Carborundum Metals Company, Inc., a new subsidiary of The Carborundum Company, has signed a contract with the Atomic Energy Commission for the production of zirconium and hafnium metal, it has been announced by Clinton F. Robinson, president of the company.

Niles C. Bartholomew, formerly assistant director of manufacturing of The Carborundum Company, was appointed vice president of The Carborundum Metals Company, Inc., and will direct the organization and operation of the new subsidiary.

PREALLOYED STEEL POWDERS continued from page 38

der and the reduced carbon after sintering (the latter results from the decarburizing action of the hydrogen gas and of

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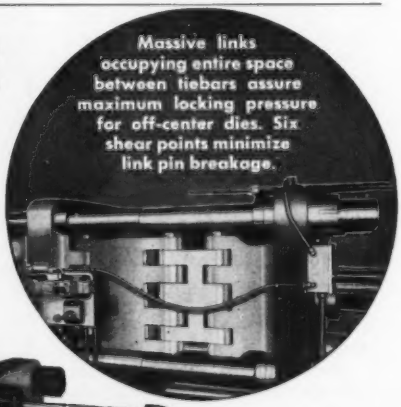

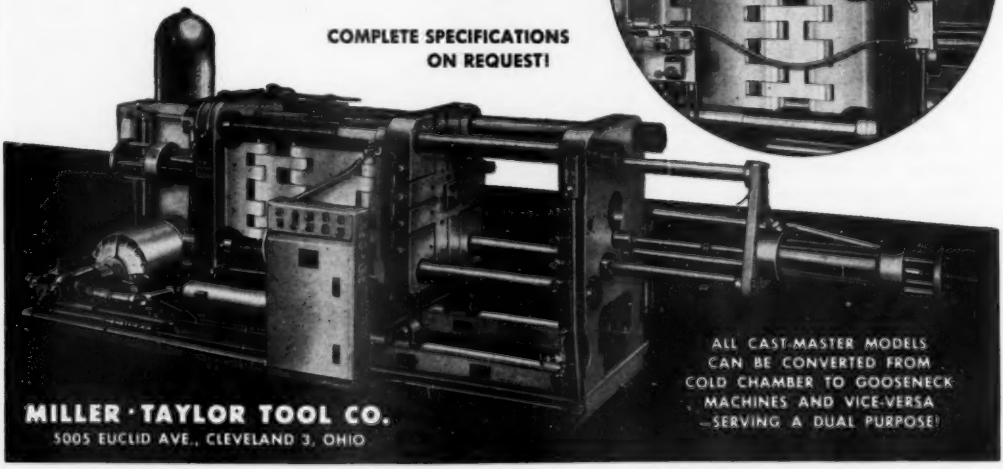

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the small amount of oxide present). A small amount of ferrite is present for the short sintering treatment at 2200 F., (Figure 11) and with longer sintering times at higher temperatures this phase becomes almost continuous, Figure 12. A few samples sintered at 2350 F. show approximately 15 to 20 percent of ferrite as a continuous phase.

These structural relationships occur in all of the high nickel grades, but type 431 (16% chromium-2% nickel) is basically a ferritic stainless steel. Its structure, accordingly, is always a single phase-ferrite. Type 318, because of its lower silicon content, will probably have less ferrite than type 313 Si after sintering at the same temperature.

Conclusions

1. *Prealloyed stainless steel powders have been developed that are readily moldable, can be sintered at temperatures as low as 2100° F. in a hydrogen atmosphere, and yield compacts with higher strengths and ductility than heretofore possible by standard powder metallurgy techniques.*

2. *The standard stainless steel powders available are 302B, 316, 318, 318 Si, and 431. These materials are available in moldable form, with irregular particle shapes for the manufacture of mechanical or corrosion resistance parts, and are also available in regular form for the production of certain filters or other porous objects.*

3. *The optimum pressing and sintering conditions vary with the powder composition. Generally, however, all standard —100 mesh powder can be pressed at 40 t.s.i. and sintered for 45 minutes at 2250° F. to give tensile strengths from 30,000 to 40,000 p.s.i. and elongations from 5 to 15 percent. Coining at 40 tons and re-sintering at 2250° F. for 45 minutes provides tensile strengths of from 55,000 to 65,000 p.s.i. and elongations of from 12 to 24 percent*

4. *The highest properties realized for the —100 mesh stainless steel powder occur in type 318 Si, where a tensile strength of 92,000 p.s.i. and elongations of 36 percent have been obtained. Type 302B stainless steel powder can achieve tensile strengths of 87,000 p.s.i. and elongations of 32 percent.*

References

4.) A. H. Grobe and R. Hoffman: "Stainless Steel Powder for Mechanical Parts," Product Engineering, Dec. 1951, p. 168.

5.) A. H. Grobe and G. A. Roberts: "Mechanical Properties of Stainless Steel Powder," Transactions, A.I.M.E., Vol. 191, p. 125.

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RETAINED AS DESIGNERS

Sundberg-Ferar, industrial designers, have announced that the firm has been retained as design consultants by Reo Motors, Inc., Lansing, Mich.

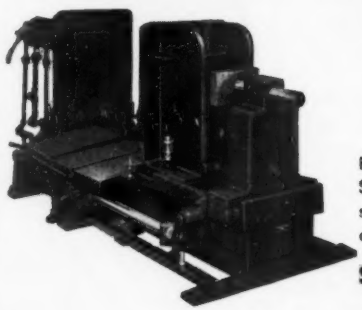
The Sundberg-Ferar firm will collaborate in the design and styling of motor trucks and other products manufactured by the company.

LESTER SHEA JOINS N.P.A.

Lester A. Shea on leave of absence as general sales manager of Lindberg Engineering Company, Chicago 12, Ill., has been selected chief, Industrial Heating Equipment Section, Metalworking Equipment Division of the National Production Authority (N.P.A.), Washington, D. C.

He is a member of American Society for Metals, American Foundry Society, Sales Executive Club of Chicago and American Institute for Management. He served 5 years on the Executive Board of the American Society for Metals, Chicago Chapter, two of which as its Secretary-Treasurer.

For additional information Circle No. 84 on the Reader Service Card



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For additional information Circle No. 67

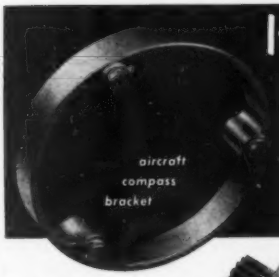
HOTPOINT TO QUIT JET PRODUCTION

Replacement of its jet engine manufacturing activities with a new line of refrigerators has been decided upon by Hotpoint, Inc. Its plant at Cicero which was originally built for the production of refrigerators, but which was tooled for jet engine production instead, will be reverted to the purpose for which it was designed.

According to reports, the last jet components will be off the line by this coming September, and refrigerators should begin to roll off the lines by mid-year 1953. Outlay for new machine tools and tooling is placed at approximately three million dollars.

Military cutbacks which seriously affected the full utilization of plant facilities is blamed for the switchover. The refrigerator plant in Cicero is immediately adjacent to the company's stove works.

It would be difficult (and expensive) to make these parts any other way!



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PROMOTIONS AND APPOINTMENTS

EUGENE F. ECKERLE, vice president of *Aluminum Industries, Inc.* will be the company's general manager and RICHARD G. TESSENDORF, sales manager of the original equipment division, will be assistant general manager in charge of manufacturi.

JOHN E. HAWLEY has joined the *Pennsylvania Salt Mfg. Company's* research and development division at the Whitemarsh Research Laboratories, Wyndmoor, Pa.

ROBERT L. BREHM has been advanced to assistant chief engineer of Snyder Tool & Engineering Co. and it subsidiary, Arthur Colton Co.

FRANK L. MAGEE, vice president and general production manager of *Aluminum Company of America*, has been elected a director of the company. ALFRED M. HUNT succeeds J.R.D. HUSTON as secretary of ALCOA following Mr. Huston's retirement.

WALTER W. EDENS is a member of the sales engineering staff of *Federated Metals Div., American Smelting & Refining Co.* and will be concerned primarily with the foundry trade.

PAUL MEZICK has been appointed district sales manager for Pennsylvania by *Octagon Process, Inc.*

JOHN W. LOHNES has been appointed vice president of sales for the *Jeffers Electronics* and *Speer Resistor Divisions of Speer Carbon Co.*

H. C. LITTLE, director of employee relations for *American Cynamid Co.*, has been named assistant to the president. Other promotions in the company are: R. E. SUMNER to be general manager of the Industrial Chemicals Div., and C. F. BONNET to be assistant general manager of the Industrial Chemicals Div.

Wellman Bronze and Aluminum Co. of Cleveland, Ohio, has announced promotion of EDWARD C. EIZEMBER from chief inspector at the Peerless and Superior plants to superintendent at the Peerless plant; ROBERT A. THOMAS from Peerless superintendent to manager of the new Garfield plant; BENJAMIN E. WEIMER to be in charge of direct customer relations.

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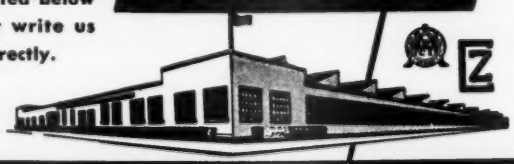

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3 COPPER ALLOYS

continued from page 48

threaded and a hole is drilled for the cam follower to be inserted. Analysis of this alloy is 86-89 percent copper, 1-1.5 percent iron and 10-11 percent aluminum. It has a tensile strength of 80,000 psi which is

fairly representative of values available from bronze permanent mold castings of various compositions. This casting is chromium plated.

For a combination of excellent detail, plateability and strength, the handle which is assembled to the stopper casting is die cast in silicon bronze. The trade name of the disposal unit is cast in a recessed panel with raised lettering. This type of lettering which can be machined directly into the die surface is the simplest, and therefore the least expensive to produce in a die cavity. By surrounding it with a textured background in a recessed panel, the lettering has been set off effectively. Chromium plating on this piece matches that on the permanent mold cast stopper.

The second die casting in this unit is a brass return arm illustrated in Figure 2. Examination of the photograph will reveal ample reasons for die casting this small but detailed element.

The combination of a double keyed hole and an extending lever arm make this piece an impossibility for screw machine and would entail prohibitive amount of machining as either a sand casting or forging.

Aside from hollow milling the top and bottom to reach closer-than-cast dimensions and concentricity, and a double broaching pass to clean up the cast keyways, the return arm needs no processing. Hollow milling is accomplished simply on a single spindle drill press.

In this group of four components, the design engineer has worked with and listened to the recommendations of the die casting vendor concerning choice of alloy and most economical casting method to specify All parts are in production on a volume basis at a competitive cost compared with any other method of fabrication. Such secondary operations as

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are required are performed by the vendor who supplies a completely machined and finished casting.

MELTING TECHNIQUES
continued from page 43

This, of course, provides the foundryman with hot metal at the moment the foundry starts in the morning.

The hourly output of this type furnace is based on the hearth area of the melting chamber. The larger the hearth, the greater the yield. In the standard furnace, a holding chamber of about twice the hourly yield of the melting hearth is provided, or in other words, a furnace having a bath of 700 lbs. has an output of about 350 lbs. per hour as this is the amount of metal that can be melted per hour in the melting chamber.

The reason for having a bath with twice the hourly yield is to

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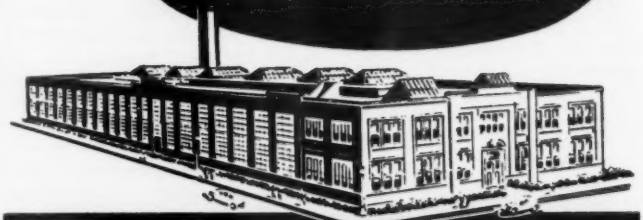
From One Source



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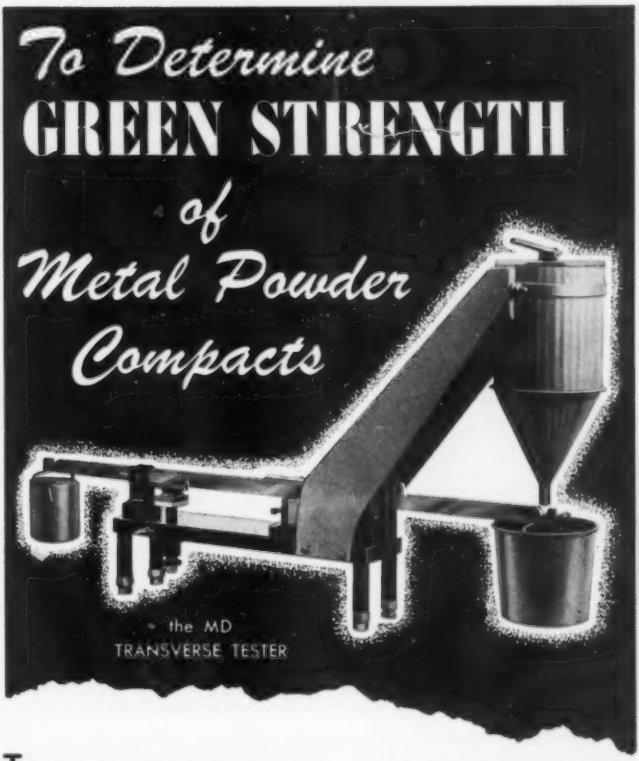
insure a constant temperature. The metal in the bath is raised from 100 to 200 degrees over the temperature of the metal entering it, and it must be large enough to absorb this difference and remain constant.

This furnace has advantages particulary in permanent mold and die casting foundries, as it completely eliminates hot charging in which metal is brought over from a breakdown furnace and poured into the holding furnace. It also does away with the possibility of contamination by getting the metals mixed in a melting room as the returns can be melted immediately after they are cast at the furnace. They are not transported back to a breakdown furnace and back again to the holding furnace. It eliminates picking up gas in transferring from a breakdown furnace to a holding furnace.

This furnace is fired with either oil or gas or combination burner but gas is recommended. It should be operated with a rich flame that is on the reducing side in order to eliminate oxidation. This is done by a simple adjustment.

The furnace is not intended for melting anything but solid material—either ingot or returns from the foundry—but not for light material such as chips, clippings, or borings. This has to be done in a furnace in which this material can be submerged.

There is one other feature of interest to the die caster and permanent mold founder, and that is that rejected castings containing inserts can be remelted in this furnace. It "sweats" the metal off of the insert and the insert can be raked out at the charging door after the aluminum is sweated off. In this furnace, the attempt has been made to combine features that will eliminate as much handling as possible, overcome difficulties encountered in melting and produce the finest castings both chemically and physically.



THE MD TRANSVERSE TESTER was especially designed for determining strength of fragile materials. Its applicability in Powder Metallurgy is the determining of strength of metal powder compacts in the *green* (unsintered) condition. This instrument meets the Metal Powder Association Standard 15-51T.

Numerical value determined by this instrument, known as the compact's "*green strength*", is useful in ascertaining if the compact will meet all the requirements of a particular job.

The instrument is used as an inspection device as well as a general laboratory instrument for development work. It is also useful in determining strength of materials other than metal powder compacts, such as ceramics, glass, plastics, etc.

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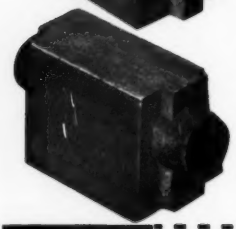

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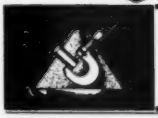

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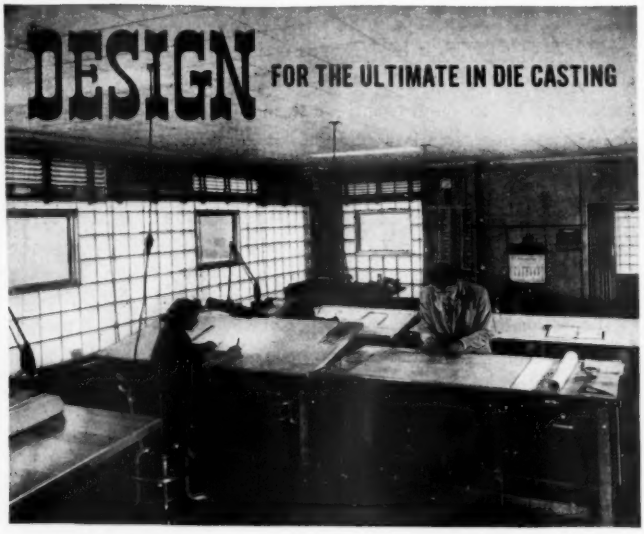

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Thoroughly experienced man in aluminum permanent mold for modern midwest foundry. Magnesium experience helpful. Essentials are ability to handle people and maintain production schedules. Technical background helpful, not required. For a qualified man who probably has at least 10 years experience, salary is open and future unlimited. Bonus plan. Send complete resume in confidence. Box No. 8252, Precision Metal Molding Magazine.

SALES ENGINEER

Leading ferrous metal powder producer requires a qualified sales engineer fully familiar with metal fabrication and tools. Headquarters in East, position requires frequent traveling. Reply in absolute confidence with complete resume to the President, c/o Box 8352, Precision Metal Moulding Magazine, All our staff know of this ad.

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Manufacturer's representative to handle powder metal products, specializing in structural and mechanical parts for expanding organization with established production. Reply to Precision Metal Molding Magazine, Box 8452.

WANTED

Die casting salesman. Reputable firm —quick estimating, economical prices —excellent results. Zamak and lead alloy die casting. Reply Precision Metal Molding Magazine, Box 8552.

NICKEL-CADMIUM BATTERY
continued from page 50

sists of immersing the plaques in nickel or cadmium salt solutions, polarizing cathodically in alkali solution, washing and drying. This cycle of treatment is repeated until the desired amount of nickel or cadmium hydroxide has been deposited in the pores of the plates. Under usual conditions, four cycles of treatment are required.

The plates, that may be cut into sizes to fit a particular cell container, are assembled into positive and negative plate groups. Sintered plate elements are commonly assembled in plastic containers. A typical cell, having a capacity of 28 A. H., is shown in Figure 3. The electrolyte is a potassium hydroxide solution, generally having a specific gravity of 1.200. On charging the active material of the positive plates is converted to nickelic hydroxide while the active material of the negative plate is reduced to metallic cadmium. On discharge, these materials revert to nickelous hydroxide and cadmium hydroxide just as in the conventional pocket-type alkaline battery.

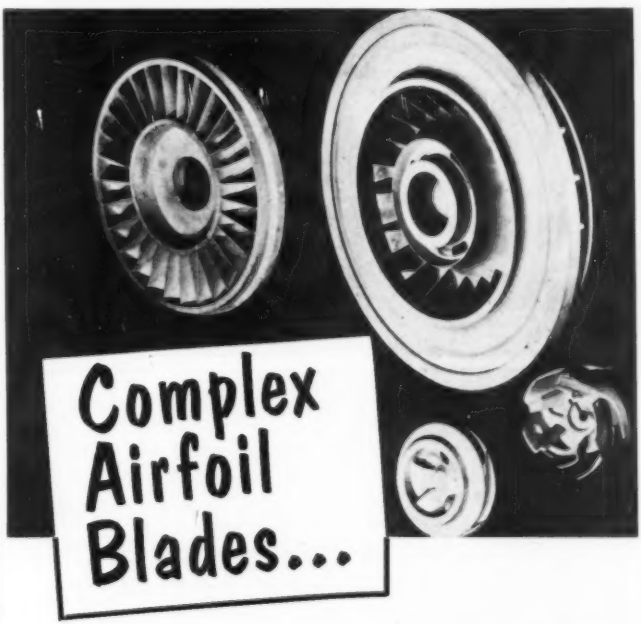
At high rates of discharge and at low temperatures, sintered plate batteries have higher capacities than other types of storage batteries of equivalent size. It is to be pointed out, however, that this type of battery is still in the developmental stage and is not in commercial production. Its proper place in the future will be determined not only by its advantages but also by its manufacturing costs.

The sintered plate battery adds to the general advantages of the conventional commercially available nickel-cadmium battery, characterized by long life and unusual ruggedness.

POWDER METAL CUTS GEAR PRODUCTION COST 80 PERCENT

A spur and mitre gear used in a business machine is being made by the Powdered Metal Products Corporation of America, Franklin Park, Ill., specialists in gear making, at a reduction of 80 percent in production costs due to elimination of 15 machining and assembly operations. This dual gear if machined from stock by conventional methods, would be prohibitively expensive; blanks for the spur and mitre sections would have to be shaped separately on turret lathes, a gear shaper would be required for cutting of teeth and burring of the spur gear, and a gear cutter would be necessary to cut the teeth of the mitre gear.

In addition, assembly operations would require further deburring as well as degreasing of both parts, plus soldering to join the two parts followed by fur-



PLASTER MOLD CAST BY
UNIVERSAL TO INCREASE OPERATING EFFICIENCIES

Hydraulic transmission wheels and fuel pump impellers cast to close tolerances with smooth surfaces in plaster molds. Sizes vary from 2" to 16" diameter. Accuracy in blade spacing and uniform blade thickness is necessary for good performance. Large size wheel operates at 3000 r.p.m. and small shrouded impeller at 36,000 r.p.m. Smooth, uniform blade surfaces produced in plaster molds reduces to a minimum resistance to flow or fluids resulting in greatly increased operating efficiencies. Wheels illustrated are cast in aluminum with trailing edges of blades cast to knife edge while other sections of blades in small impellers do not exceed 3/32". Two larger wheels are used in hydraulic transmissions and two smaller impellers on airplane fuel pumps. Accuracy in casting blade form combined with close tolerance on variable blade sections is a necessary requirement. All types of complex blade designs can be produced in plaster molds.

UNIVERSAL CASTINGS CORP.

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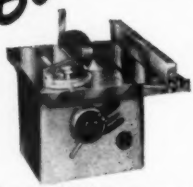
nace or induction brazing

By powder metal processing the gear is formed as a single piece at a single stroke. The metal powder is dumped into the hopper of a Stokes powder metal press, from which it flows into the die cavity to be compressed by punches moving simultaneous from above and below. After the piece has been pressed, it is relatively fragile and must be sintered; after sintering, it is tough enough to meet all strength requirements. Extremely close tolerances eliminate the need for any final machining or other finishing, and of course assembly operations are not required.

Similar savings have been made in manufacturing other gears with powder metal. A small bevel gear for a power drill with a tensile strength of 100,000 psi, made with a saving of eight machine operations and an 86 percent reduction in cost is an outstanding example of the economy of powder metals.

Better CASTINGS
(NON-FERROUS)
SAND CASTINGS
PERMANENT MOLD
DIE CASTINGS



Illustrated below are some of the parts for this saw cast at our foundry.

Hampden Brass & Aluminum Co. is fully equipped to handle all casting problems — from engineering to finished casting.

PATTERN SHOP • X-RAY & LABORATORY FACILITIES

PERMANENT MOLD CASTINGS

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PRESSURE CASTINGS • HEAT TREATING

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USEFUL LITERATURE

continued from page 61

Electroplating Anode Source: **No. 167**
A brochure from Wagner Brothers, Inc., presents electroplating anodes manufactured by the company, including ball, "Flat-Top" and "Iso-Cast" shapes. Cadmium copper, zinc and tin are included.

Self-Adhering Tape: **No. 168**
Eight types of self-adhering tape for many purposes are included in a leaflet available from Mystik Adhesive Products. Included are tapes that can be die cut for paint spray masking or abrasive blast masking.

Ball Burnishing Compound: **No. 169**
Economical ball burnishing of steel, brass and aluminum by use of Oakite Composition No. 3 is discussed in a data sheet from Oakite Products, Inc.

Rust-Resistant Coatings for Iron & Steel: **No. 170**
A brochure on Parco Compounds issued by Parker Rust Proof Company discusses rust resistant finishes for iron and steel Equipment, materials, test results and other information are included.

White Alloy Plating as Substitute for Nickel: **No. 171**
One of several types of metal finishes and plating methods outlined in a folder from Promat Div., Poor & Co., is the company's new Probrite White Alloy which is an acceptable alternate for nickel plating. It can be used over copper, steel or die castings.

Check List of Metal Finishing Products: **No. 172**
A check list of 53 different metal finishing products manufactured by Enthone Inc., has been compiled into a leaflet. Among the products are included aluminum finishing materials, metal blackeners, metal strippers, corrosion protective chemicals and metal cleaners.

Clear Synthetic Enamels Over Chrome Plate: **No. 173**
Clear synthetic enamels which are being used as a protective coating over chromium plating are the subject of a technical bulletin from Rinshed-Mason Co. Test panels have been salt spray tested and exposed to Florida conditions for one year without failure, according to the data sheet.

Barrel Finishing Equipment & Compounds: **No. 174**
An 8-page booklet from Minnesota Mining & Manufacturing Co. gives details of barrel finishing with Honite compounds and equipment. Featured is the 3M One-Load Method which saves handling time and labor.

Perchlorethylene As a Vapor Degreaser: **No. 175**
A small folder from Diamond Alkali Co. presents perchlorethylene as a cleaning material. Properties and applications are included, and the solvent is recommended for vapor degreasing work.

Black Oxide Finish for Steel: **No. 176**
Reprints of an article "Low Cost Black Oxide Finish Produced on Steel by Chemical Dip Method" are available from Mitchell-Bradford Chemical Co.

Portable Belt Grinding Attachment: **No. 177**
A new, portable grinding attachment has been introduced by Carborundum Company utilizing their "61" serrated type rubber contact wheel. A piece of literature describing and illustrating the uses for the new versatile grinding unit has been distributed.

Collection of Articles on Barrel Finishing: **No. 178**
A collection of editorial articles on the Roto-Finish process of barrel finishing has just been released. Articles show how the process is applied for specific problems.

Why Metals Corrode: **No. 179**
An article, "Why Metals Corrode" by J. R. Akers, chief corrosion engineer for Reynolds Metals Co., is featured in the current issue of Reynolds Metals "Technical Advisor." Also included is an article on machining aluminum.

For
Ready
Reference . . .
This file folder on PV Investments contains data you need for ordering—free samples for testing or production lots. Send for a free copy and have it ready next time you need these materials.
You get fine castings with PV Investments; manufactured under strict laboratory control and thoroughly tested to assure uniform performance. Priced right and prompt shipment!
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CLEVELAND 17, OHIO

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COST IS REDUCED
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PLANT CAPACITY IS INCREASED
for G. L. Brownell, Inc., Worcester, Mass., manufacturer of gear driven twisting machinery for textile mills since 1881.
". . . The Traverse Head illustrated, for many years machined from a bronze sand casting, is now a Hitchiner precision investment casting in manganese bronze. The cost of the piece has been reduced, quality maintained and productive capacity increased at the Brownell shop."
From a letter from Carl R. Brownell, President, G. L. Brownell, Inc.
Added to all these advantages is the improved appearance inherent in precision investment castings. Ask Hitchiner how to solve your investment casting problems. Write for free folder. Send your drawings for complete engineering analysis and recommendation.
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MILFORD 7, NEW HAMPSHIRE
Sales Office: 967 Farmington Ave., West Hartford 7, Conn.
Representatives in all principal cities.

COLLOIDAL GRAPHITE PARTING COMPOUND FOR CLUTCH PLATE SEPARATORS

The sintering together of powdered metal clutch plate compacts in a sintering oven can be eliminated by using an aqueous dispersion of of semi-colloidal graphite, according to the experience of the S. K. Wellman Co., Cleveland.

Wellman selected this parting compound—known as "Prodag"—because by producing an unusually slippery dry film which is unaffected by any temperature met in the sintering oven, it markedly decreases compact rejects.

The compacts, made from a mixture of fine, powdered metal and powdered graphite, and compressed by mechanical means into the shape of the clutch plates, are placed in the electrical oven and sintered to metal rings, one compact to either side of the ring.

Many of these rings are stacked on top of one another in the oven. In order to prevent the sintering together of the top compact of one ring and bottom of the ring above, stainless steel separating discs are coated with "Prodag".

The discs are heated with infra-red rays in a specially designed conveyor. A mixture of two parts colloidal graphite and one part water is sprayed on the separators as they pass the spray booth. On the second pass around the conveyor the opposite side is sprayed.

CRUSHING STRENGTH
continued from page 29

both faces of the hub is the only secondary machining that is needed.

Heat treatment is to case carburize by cyaniding for one hour at 1650 F, air cool and reheat to 1400 F for one-half hour then quench in 5 percent caustic solution. After quenching the rolls are treated in hot water for three hours to remove any caustic that might be entrapped in the pores. This treatment gives a case depth of 0.010 to 0.015 and a hardness of over 50 Rockwell C.

Since wear and crushing strength are considered the most important properties the powdered iron rolls are checked for these two properties. Comparison of a powdered iron roll with a steel roll is given in Table 1. These values are, of course, average for a large number of units.

Savings in manufacturing cost are the principal reason for changing to a new method or material. In the case of these chain rolls the apparent cost reduction was, on the first order between 15 and 20 percent. This is only an apparent savings, however, since the entire tooling cost was written off on this first order. All subsequent production lots have shown greater savings but actual figures are not available.

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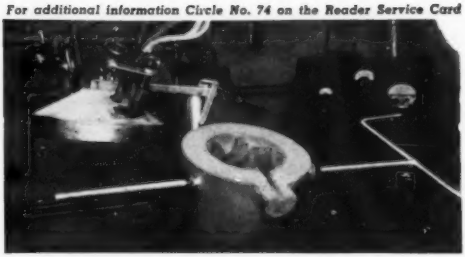

For lab melts, pilot plant and small production . . .

The PT POT TILTING Furnace

This Detroit Electric Furnace has been specially developed to produce small melts of any metal with ease, economy and speed. 15-pound capacity pot can be used as a crucible or tilted to pour directly into molds. Roof lifts and swings for easy loading. Complete with controls. Full information on request.

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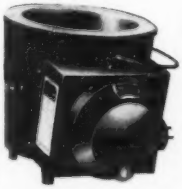
"Precision" WAX MELTERS for PRECISION WAX MOLDS

Melting wax to precise temperature and consistency for making expendable molds may be greatly simplified and production speeded up if the melting pot operates with dependability. Sta-Warm wax pots, adapted to your particular needs are available with precisely the features you require.

Why not inquire about them today? Outline your requirements and a proposal will come back to you promptly . . . and without obligation.



Typical 4-qt. wax melter wth variable thermostat, model WV.

Sta-Warm ELECTRIC CO.
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Allied Research Products, Inc. 54
Almco Div. Queen City Stove Works, Inc. 62
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Aluminum Smelting & Refining Co. 12
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continued next page

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Impregnate
PRESSURE CASTINGS
Economically

A positive, low-cost method of impregnating pressure castings to meet the most rigid specifications. Pressure castings impregnated with this equipment have been successfully subjected to severe tests with hot kerosene, hot oil, hot water and other solutions under pressure, with no evidence of porosity remaining.

Meets All Contract Specifications

If your contract calls for casting impregnation, get the facts on this MOGULLIZER packaged plant which utilizes both pressure and vacuum stages.

Write today for free literature and recommendations for your casting salvage problems.

NOTE: There are job shops in certain areas who can take care of your contract work. A few territories are still open for job shop installation. Write for set-up plan today.

METALLIZING CO. OF AMERICA
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COMPLEX DIE CASTING by YODER

The inset photograph shows the intricate details of this complex die casting.

Complexity is a challenge to Yoder . . . a challenge that our modern plant facilities are equipped to cope with! The die casting illustrated, part of a spray gun assembly, is just one example of a complex die casting produced by Yoder. Yoder Die Castings excel in workmanship, accuracy, appearance and function. Send Yoder your complex die casting problems. Call, wire, or write today!

Centrally located to industrial producers

Yoder
DIE CASTING, INC.
728 Kiser Street • Dayton 4, Ohio

are required are performed by the vendor who supplies a completely machined and finished casting.

MELTING TECHNIQUES
continued from page 43

This, of course, provides the foundryman with hot metal at the moment the foundry starts in the morning.

The hourly output of this type furnace is based on the hearth area of the melting chamber. The larger the hearth, the greater the yield. In the standard furnace, a holding chamber of about twice the hourly yield of the melting hearth is provided, or in other words, a furnace having a bath of 700 lbs. has an output of about 350 lbs. per hour as this is the amount of metal that can be melted per hour in the melting chamber.

The reason for having a bath with twice the hourly yield is to

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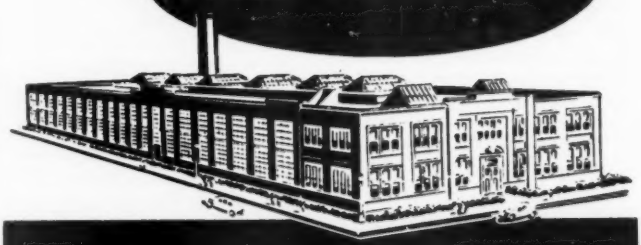
From One Source



A COMPLETE DIE CASTING SERVICE
. . . FROM DESIGN TO FINISHED PRODUCT.

No matter what your die casting requirements may be, Central has the facilities, the equipment, the experience and trained personnel to produce castings to meet your rigid specifications. Take advantage of Central's complete facilities and be assured of prompt economical service on the best castings made.

- Complete engineering and design service
- Die and tool making
- Most modern production equipment
- Research and quality control facilities
- Machining and finishing

May we help you with your production requirements.

Write today for prompt and practical assistance

CENTRAL Die Casting & Mfg. Co.
2935 W. 47th Street • Chicago 32, Illinois

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ZINC OR ALUMINUM die castings of highest quality produced on modern, fast equipment. Guaranteed satisfaction. Prompt service.

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Tell us your needs. Send blueprints or drawings for quotation. No obligation, of course.

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THE CASE OF THE "IMPOSSIBLE" PENCIL NUT
Scripto's new design seemed impossible until Gries solved the problem with a zinc alloy precision die casting which made the intricate part practical.
This greater design flexibility resulted in a new product achieving far-reaching sales advantages . . . because Scripto decided to "ask Gries." Gries' exclusive facilities produce simple or intricate tiny parts in one automatic operation . . . completely trimmed, ready for use . . . 100,000 parts or many millions.

- Precision
- Smallness
- Faster Production
- Close Tolerances
- Reduced Scrap Loss
- Simplification
- Product Improvement
- Economy
- Design Flexibility

GRC
TINY ZINC DIE CASTINGS
SMALLNESS UNLIMITED
Max. Wt. ½ oz.
Max. Lgth. 1¾"

Send us your specifications and get the complete story. WRITE, WIRE, PHONE TODAY!

GRIES REPRODUCER CORP.
814 E. 133rd St., New York 54 • Phone: MOtt Haven 5-7400

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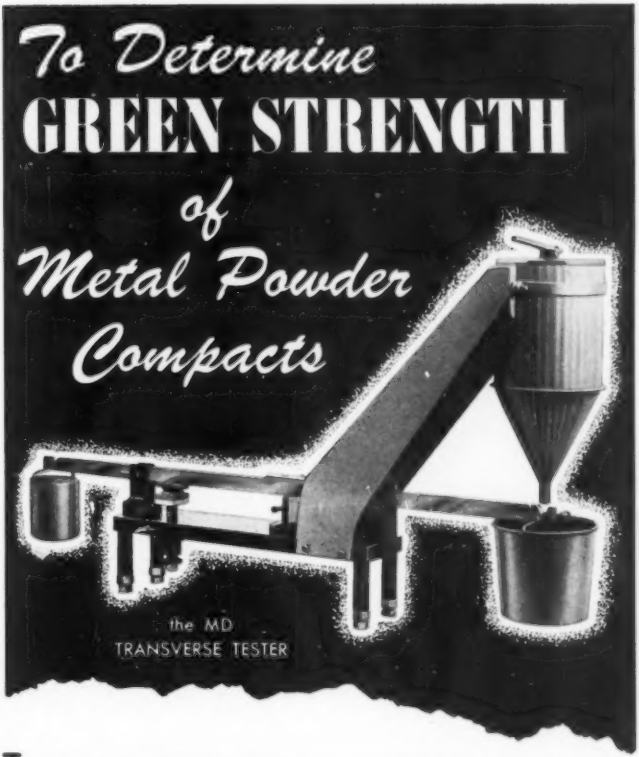
insure a constant temperature. The metal in the bath is raised from 100 to 200 degrees over the temperature of the metal entering it, and it must be large enough to absorb this difference and remain constant.

This furnace has advantages particulary in permanent mold and die casting foundries, as it completely eliminates hot charging in which metal is brought over from a breakdown furnace and poured into the holding furnace. It also does away with the possibility of contamination by getting the metals mixed in a melting room as the returns can be melted immediately after they are cast at the furnace. They are not transported back to a breakdown furnace and back again to the holding furnace. It eliminates picking up gas in transferring from a breakdown furnace to a holding furnace.

This furnace is fired with either oil or gas or combination burner but gas is recommended. It should be operated with a rich flame that is on the reducing side in order to eliminate oxidation. This is done by a simple adjustment.

The furnace is not intended for melting anything but solid material—either ingot or returns from the foundry—but not for light material such as chips, clippings, or borings. This has to be done in a furnace in which this material can be submerged.

There is one other feature of interest to the die caster and permanent mold founder, and that is that rejected castings containing inserts can be remelted in this furnace. It "sweats" the metal off of the insert and the insert can be raked out at the charging door after the aluminum is sweated off. In this furnace, the attempt has been made to combine features that will eliminate as much handling as possible, overcome difficulties encountered in melting and produce the finest castings both chemically and physically.



THE MD TRANSVERSE TESTER was especially designed for determining strength of fragile materials. Its applicability in Powder Metallurgy is the determining of strength of metal powder compacts in the *green* (unsintered) condition. This instrument meets the Metal Powder Association Standard 15-51T.

Numerical value determined by this instrument, known as the compact's "*green strength*", is useful in ascertaining if the compact will meet all the requirements of a particular job.

The instrument is used as an inspection device as well as a general laboratory instrument for development work. It is also useful in determining strength of materials other than metal powder compacts, such as ceramics, glass, plastics, etc.

Write for price and complete details.

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Plants: Elizabeth, N. J., Manchester, N. H., Berkeley, Calif., Emeryville, Calif.
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METAL PIGMENTS
METAL ABRASIVES

WORLD'S LARGEST MANUFACTURER OF FINELY DIVIDED METALS

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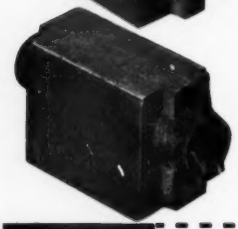
Precision Made . . .
For Precision
Performance



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precision made from exclusively formulated non-ferrous Sintroloy and Ductiloy are molded to close tolerances, thereby eliminating machining of intricate shape and high scrap loss.

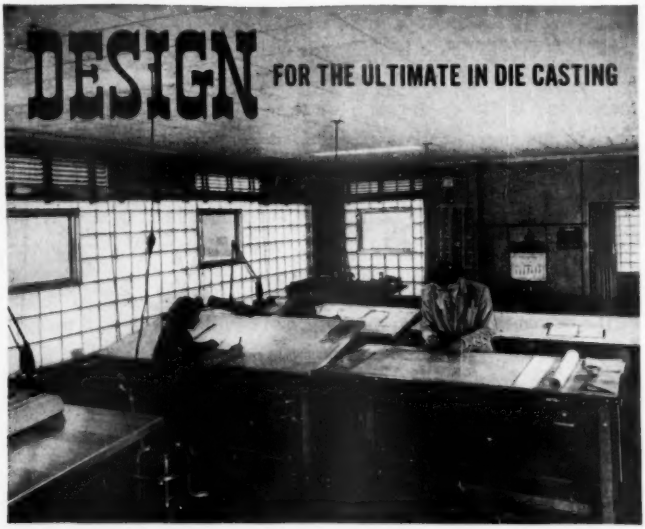
Perhaps we may be able to help you solve specific parts problems. Get in touch with National Molded today for prompt attention.

Write today for detailed information and free literature on cost-saving standard bearings which are available from stock.

NATIONAL MOLDED PRODUCTS, INC.

1942 MILL ST. • ST. MARYS, PA.

DESIGN FOR THE ULTIMATE IN DIE CASTING



NE

We offer every customer competent engineering assistance in product design. This service assures you lowest tooling cost, flexibility of production . . . highest quality at lowest cost.

THE NEW ENGLAND DIE CASTING CO.

445 Front Avenue West Haven, Conn.

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OPPORTUNITIES

CHIEF ENGINEER

Salary $8000 - $10,000

Permanent mold and die cast die design experience in light metals required. Man we want has a sound record behind him and has top management ambitions for the future. Bonus plan. Write in detail. Box No. 8152, Precision Metal Molding Magazine.

FOUNDRY SUPERINTENDENT

Thoroughly experienced man in aluminum permanent mold for modern midwest foundry. Magnesium experience helpful. Essentials are ability to handle people and maintain production schedules. Technical background helpful, not required. For a qualified man who probably has at least 10 years experience, salary is open and future unlimited. Bonus plan. Send complete resume in confidence. Box No. 8252, Precision Metal Molding Magazine.

SALES ENGINEER

Leading ferrous metal powder producer requires a qualified sales engineer fully familiar with metal fabrication and tools. Headquarters in East, position requires frequent traveling. Reply in absolute confidence with complete resume to the President, c/o Box 8352, Precision Metal Moulding Magazine, All our staff know of this ad.

WANTED

Manufacturer's representative to handle powder metal products, specializing in structural and mechanical parts for expanding organization with established production. Reply to Precision Metal Molding Magazine, Box 8452.

WANTED

Die casting salesman. Reputable firm —quick estimating, economical prices —excellent results. Zamak and lead alloy die casting. Reply Precision Metal Molding Magazine, Box 8552.

NICKEL-CADMIUM BATTERY
continued from page 50

sists of immersing the plaques in nickel or cadmium salt solutions, polarizing cathodically in alkali solution, washing and drying. This cycle of treatment is repeated until the desired amount of nickel or cadmium hydroxide has been deposited in the pores of the plates. Under usual conditions, four cycles of treatment are required.

The plates, that may be cut into sizes to fit a particular cell container, are assembled into positive and negative plate groups. Sintered plate elements are commonly assembled in plastic containers. A typical cell, having a capacity of 28 A. H., is shown in Figure 3. The electrolyte is a potassium hydroxide solution, generally having a specific gravity of 1.200. On charging the active material of the positive plates is converted to nickelic hydroxide while the active material of the negative plate is reduced to metallic cadmium. On discharge, these materials revert to nickelous hydroxide and cadmium hydroxide just as in the conventional pocket-type alkaline battery.

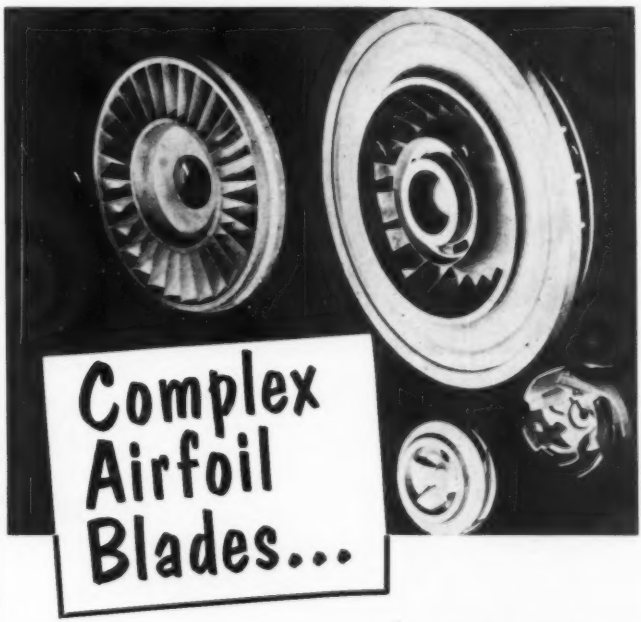
At high rates of discharge and at low temperatures, sintered plate batteries have higher capacities than other types of storage batteries of equivalent size. It is to be pointed out, however, that this type of battery is still in the developmental stage and is not in commercial production. Its proper place in the future will be determined not only by its advantages but also by its manufacturing costs.

The sintered plate battery adds to the general advantages of the conventional commercially available nickel-cadmium battery, characterized by long life and unusual ruggedness.

POWDER METAL CUTS GEAR PRODUCTION COST 80 PERCENT

A spur and mitre gear used in a business machine is being made by the Powdered Metal Products Corporation of America, Franklin Park, Ill., specialists in gear making, at a reduction of 80 percent in production costs due to elimination of 15 machining and assembly operations. This dual gear if machined from stock by conventional methods, would be prohibitively expensive; blanks for the spur and mitre sections would have to be shaped separately on turret lathes, a gear shaper would be required for cutting of teeth and burring of the spur gear, and a gear cutter would be necessary to cut the teeth of the mitre gear.

In addition, assembly operations would require further deburring as well as degreasing of both parts, plus soldering to join the two parts followed by fur-



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nace or induction brazing

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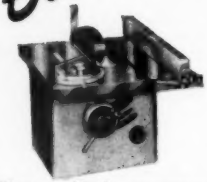
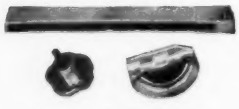
PERMANENT MOLD
DIE CASTINGS



Illustrated below are some of the parts for this saw cast at our foundry.

Hampden Brass & Aluminum Co. is fully equipped to handle all casting problems — from engineering to finished casting.

PATTERN SHOP • X-RAY & LABORATORY FACILITIES



PERMANENT MOLD CASTINGS

SAND CASTINGS

PRESSURE CASTINGS • HEAT TREATING

HB
HAMPDEN BRASS & ALUMINUM CO.
INCORPORATED 1901
SPRINGFIELD 1, MASSACHUSETTS

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SEVERANCE REGRINDING SERVICE
CONSERVES STRATEGIC MATERIALS
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If you don't have a SEVERANCE "ALL STAR" Catalog, ask for one today!

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USEFUL LITERATURE

continued from page 61

Electroplating Anode Source: **No. 167**
A brochure from Wagner Brothers, Inc., presents electroplating anodes manufactured by the company, including ball, "Flat-Top" and "Iso-Cast" shapes. Cadmium copper, zinc and tin are included.

Self-Adhering Tape: **No. 168**
Eight types of self-adhering tape for many purposes are included in a leaflet available from Mystik Adhesive Products. Included are tapes that can be die cut for paint spray masking or abrasive blast masking.

Ball Burnishing Compound: **No. 169**
Economical ball burnishing of steel, brass and aluminum by use of Oakite Composition No. 3 is discussed in a data sheet from Oakite Products, Inc.

Rust-Resistant Coatings for Iron & Steel: **No. 170**
A brochure on Parco Compounds issued by Parker Rust Proof Company discusses rust resistant finishes for iron and steel Equipment, materials, test results and other information are included.

White Alloy Plating as Substitute for Nickel: **No. 171**
One of several types of metal finishes and plating methods outlined in a folder from Promat Div., Poor & Co., is the company's new Probrite White Alloy which is an acceptable alternate for nickel plating. It can be used over copper, steel or die castings.

Check List of Metal Finishing Products: **No. 172**
A check list of 53 different metal finishing products manufactured by Enthone Inc., has been compiled into a leaflet. Among the products are included aluminum finishing materials, metal blackeners, metal strippers, corrosion protective chemicals and metal cleaners.

Clear Synthetic Enamels Over Chrome Plate: **No. 173**
Clear synthetic enamels which are being used as a protective coating over chromium plating are the subject of a technical bulletin from Rinshed-Mason Co. Test panels have been salt spray tested and exposed to Florida conditions for one year without failure, according to the data sheet.

Barrel Finishing Equipment & Compounds: **No. 174**
An 8-page booklet from Minnesota Mining & Manufacturing Co. gives details of barrel finishing with Honite compounds and equipment. Featured is the 3M One-Load Method which saves handling time and labor.

Perchlorethylene As a Vapor Degreaser: **No. 175**
A small folder from Diamond Alkali Co. presents perchlorethylene as a cleaning material. Properties and applications are included, and the solvent is recommended for vapor degreasing work.

Black Oxide Finish for Steel: **No. 176**
Reprints of an article "Low Cost Black Oxide Finish Produced on Steel by Chemical Dip Method" are available from Mitchell-Bradford Chemical Co.

Portable Belt Grinding Attachment: **No. 177**
A new, portable grinding attachment has been introduced by Carborundum Company utilizing their "61" serrated type rubber contact wheel. A piece of literature describing and illustrating the uses for the new versatile grinding unit has been distributed.

Collection of Articles on Barrel Finishing: **No. 178**
A collection of editorial articles on the Roto-Finish process of barrel finishing has just been released. Articles show how the process is applied for specific problems.

Why Metals Corrode: **No. 179**
An article, "Why Metals Corrode" by J. R. Akers, chief corrosion engineer for Reynolds Metals Co., is featured in the current issue of Reynolds Metals "Technical Advisor." Also included is an article on machining aluminum.

For Ready Reference . . .
PV INVESTMENTS
This file folder on PV Investments contains data you need for ordering—free samples for testing or production lots. Send for a free copy and have it ready next time you need these materials.
You get fine castings with PV Investments; manufactured under strict laboratory control and thoroughly tested to assure uniform performance. Priced right and prompt shipment!
PRE-VEST inc.
23420 LAKELAND BLVD.
CLEVELAND 17, OHIO

WITH HITCHINER
PRECISION INVESTMENT CASTINGS
COST IS REDUCED
QUALITY IS MAINTAINED
PLANT CAPACITY IS INCREASED
for G. L. Brownell, Inc., Worcester, Mass., manufacturer of gear driven twisting machinery for textile mills since 1881.
". . . The Traverse Head illustrated, for many years machined from a bronze sand casting, is now a Hitchiner precision investment casting in manganese bronze. The cost of the piece has been reduced, quality maintained and productive capacity increased at the Brownell shop."
From a letter from Carl R. Brownell, President, G. L. Brownell, Inc.
Added to all these advantages is the improved appearance inherent in precision investment castings. Ask Hitchiner how to solve your investment casting problems. Write for free folder. Send your drawings for complete engineering analysis and recommendation.
HITCHINER MANUFACTURING COMPANY, INC.
MILFORD 7, NEW HAMPSHIRE
Sales Office: 967 Farmington Ave., West Hartford 7, Conn.
Representatives in all principal cities.

For additional information Circle No. 78 on the Reader Service Card *For additional information Circle No. 73 on the Reader Service Card*

COLLOIDAL GRAPHITE PARTING COMPOUND FOR CLUTCH PLATE SEPARATORS

The sintering together of powdered metal clutch plate compacts in a sintering oven can be eliminated by using an aqueous dispersion of of semi-colloidal graphite, according to the experience of the S. K. Wellman Co., Cleveland.

Wellman selected this parting compound—known as "Prodag"—because by producing an unusually slippery dry film which is unaffected by any temperature met in the sintering oven, it markedly decreases compact rejects.

The compacts, made from a mixture of fine, powdered metal and powdered graphite, and compressed by mechanical means into the shape of the clutch plates, are placed in the electrical oven and sintered to metal rings, one compact to either side of the ring.

Many of these rings are stacked on top of one another in the oven. In order to prevent the sintering together of the top compact of one ring and bottom of the ring above, stainless steel separating discs are coated with "Prodag".

The discs are heated with infra-red rays in a specially designed conveyor. A mixture of two parts colloidal graphite and one part water is sprayed on the separators as they pass the spray booth. On the second pass around the conveyor the opposite side is sprayed.

CRUSHING STRENGTH
continued from page 29

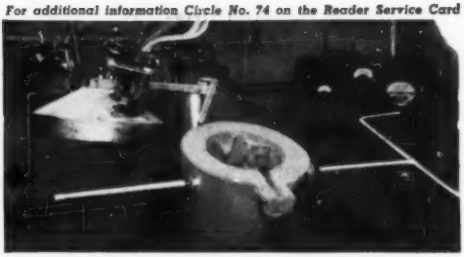
both faces of the hub is the only secondary machining that is needed.

Heat treatment is to case carburize by cyaniding for one hour at 1650 F, air cool and reheat to 1400 F for one-half hour then quench in 5 percent caustic solution. After quenching the rolls are treated in hot water for three hours to remove any caustic that might be entrapped in the pores. This treatment gives a case depth of 0.010 to 0.015 and a hardness of over 50 Rockwell C.

Since wear and crushing strength are considered the most important properties the powdered iron rolls are checked for these two properties. Comparison of a powdered iron roll with a steel roll is given in Table 1. These values are, of course, average for a large number of units.

Savings in manufacturing cost are the principal reason for changing to a new method or material. In the case of these chain rolls the apparent cost reduction was, on the first order between 15 and 20 percent. This is only an apparent savings, however, since the entire tooling cost was written off on this first order. All subsequent production lots have shown greater savings but actual figures are not available.

For additional information Circle No. 74 on the Reader Service Card



For lab melts, pilot plant and small production . . .

The PT POT TILTING Furnace

This Detroit Electric Furnace has been specially developed to produce small melts of any metal with ease, economy and speed. 15-pound capacity pot can be used as a crucible or tilted to pour directly into molds. Roof lifts and swings for easy loading. Complete with controls. Full information on request.

WRITE FOR DETAILS

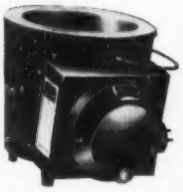
DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY
1070 26th St. • BAY CITY, MICHIGAN

Foreign Representatives: In BRAZIL—Equipamentos Industrias "Elea" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castelhvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Antenas 32-13, Apartado 27A3, Mexico 6, D.F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

"Precision" WAX MELTERS for PRECISION WAX MOLDS

Melting wax to precise temperature and consistency for making expendable molds may be greatly simplified and production speeded up if the melting pot operates with dependability. Sta-Warm wax pots, adapted to your particular needs are available with precisely the features you require.

Why not inquire about them today? Outline your requirements and a proposal will come back to you promptly . . . and without obligation.



Typical 4-qt. wax melter wth variable thermostat, model WV.

Sta-Warm ELECTRIC CO.
525 N. CHESTNUT ST. • RAVENNA, OHIO

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For additional information Circle No. 75 on the Reader Service Card

Impregnate PRESSURE CASTINGS Economically

A positive, low-cost method of impregnating pressure castings to meet the most rigid specifications. Pressure castings impregnated with this equipment have been successfully subjected to severe tests with hot kerosene, hot oil, hot water and other solutions under pressure, with no evidence of porosity remaining.

Meets All Contract Specifications

If your contract calls for casting impregnation, get the facts on this MOGULLIZER packaged plant which utilizes both pressure and vacuum stages.

Write today for free literature and recommendations for your casting salvage problems.

NOTE: There are job shops in certain areas who can take care of your contract work. A few territories are still open for job shop installation. Write for set-up plan today.

METALLIZING CO. OF AMERICA

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COMPLEX DIE CASTING by YODER

The inset photograph shows the intricate details of this complex die casting.

Complexity is a challenge to Yoder . . . a challenge that our modern plant facilities are equipped to cope with! The die casting illustrated, part of a spray gun assembly, is just one example of a complex die casting produced by Yoder. Yoder Die Castings excel in workmanship, accuracy, appearance and function. Send Yoder your complex die casting problems. Call, wire, or write today!

Centrally located to industrial producers

Yoder DIE CASTING, INC.

728 Kiser Street • Dayton 4, Ohio

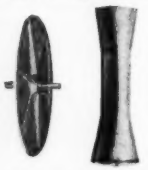
"...git thar fustest..." with Die Castings

That grizzled Confederate Cavalry Leader, General Nathan Bedford Forrest, explained his daring victories by stating "I git thar fustest with the mostest." That Civil War phrase still applies to the marketing of manufactured products in these competitive days of efficiency and speed, coupled with economy.

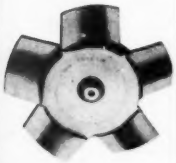
Magnesium and Aluminum Have Innumerable Uses

In many cases, the manufacturers of products die cast of the new lightweight alloys—Magnesium and Aluminum—can "fustest" increase the speed of their production through die casting. Also, they can get the "mostest" for their investment through the important savings made possible by the use of these weight-saving metals and the elimination of much costly labor otherwise required for machining and finishing. *Illustrated are a few of the products manufactured by Litemetal Dicast, Inc. for varied concerns in metal consuming industries.*

Portable Equipment



Wire and Textile Spools



Automotive Parts

Aircraft Parts

Litemetal Dicast, Inc. is an organization of specialists—men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs—little machines for little jobs . . . the right sizes and types of the most modern die casting equipment. Our facilities are complete for producing parts from button size to large cable spools.

Write today for literature and design information. Quick action on inquiries.

LITEMETAL DICAST Inc.

A DIVISION OF HAYES INDUSTRIES

1925 WILDWOOD AVE · JACKSON, MICHIGAN

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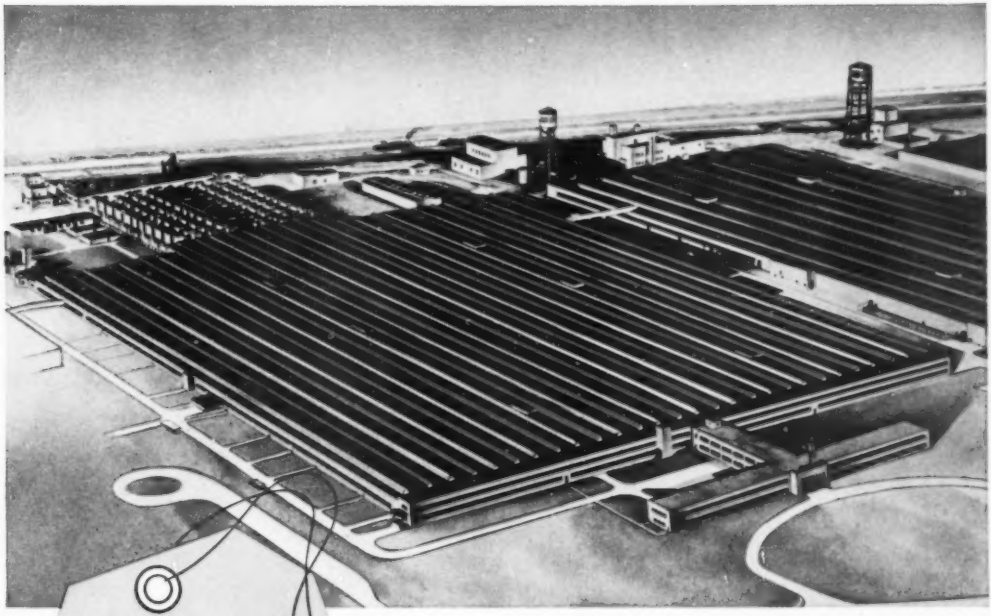

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The Finest in Magnesium Die Castings by...

AUTO-LITE

EXPANDED production facilities at Auto-Lite's tremendous Lockland, Ohio, plant now enable us to produce "feather-weight"—precision-built Magnesium Die Castings. Wherever you need light weight . . . high accuracy . . . good bearing properties . . . superior machinability . . . Auto-Lite Magnesium Die Castings can provide the answer to your production problems. Whether it's Magnesium, Aluminum or Zinc Die Castings, let Auto-Lite supply your need.

Your Inquiries Are Invited

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An invitation to companies casting in ALUMINUM . . .

Through its various integrated company operations ✻ Christiansen Corporation is in a unique position to help solve customer problems.

Foundrymen and die casters for many years have relied on the dependability of EDCO aluminum alloy ingots as their standard of quality. Nationally recognized Christiansen metallurgists combine their valuable knowledge with modern laboratory facilities to maintain and control the quality of every EDCO ingot produced.

✻ The Christiansen Laboratories provide expert consultation and complete light metals testing at nominal cost. Write for "Quality Increases Sales" to obtain complete information and price schedule.

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the name EDCO assures quality control

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